THE INSTITUTE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences
Põllumajandus- ja keskkonnainstituut
Institute of Agricultural and Environmental Sciences

Contents

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INSTITUTE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

www.emu.ee
Eesti Maaülikool
Estonian University of Life Sciences

"We care about Nature. We seek to promote a caring and sustainable approach to human activity in Nature. Our role is to recognize that cultural and natural values are often interrelated and they should be considered in an integrated manner to grant the quality of habitat and natural values."

Aret Vooremäe
Director of IAES

A. Vooremäe

The mission of the Estonian University of Life Sciences is to guarantee sustainable use of natural resources and enhance rural development.

The Estonian University of Life Sciences (IAES) is the only university in Estonia whose priorities in academic and research activities provide the sustainable development of natural resources necessary for the existence of Human Society as well as the preservation of heritage and habitat.

The Estonian University of Life Sciences undertakes internationally acknowledged science research, carries out innovative activities, provides science based academic education and promotes life-long learning.

The Institute of Agricultural and Environmental Sciences at the Estonian University of Life Sciences is responsible for research and development, and university level education in plant cultivation and plant biology, horticulture, plant health, soil science and agrochemistry, landscape ecology and management, landscape architecture, biological diversity and applied hydrobiology in Estonia.

SHORT HISTORY

The Institute of Agricultural and Environmental Sciences was established in 2005 by merging six of the ten research and education institutions, which comprised the Estonian University of Life Sciences:

I. The Faculty of Agronomy (which consisted of five Institutes - Horticulture, Plant Cultivation, Plant Protection, Soil Science and Agrochemistry, and Grassland Science),

II. The Institute of Environmental Protection,

III. The Institute of Experimental Biology,

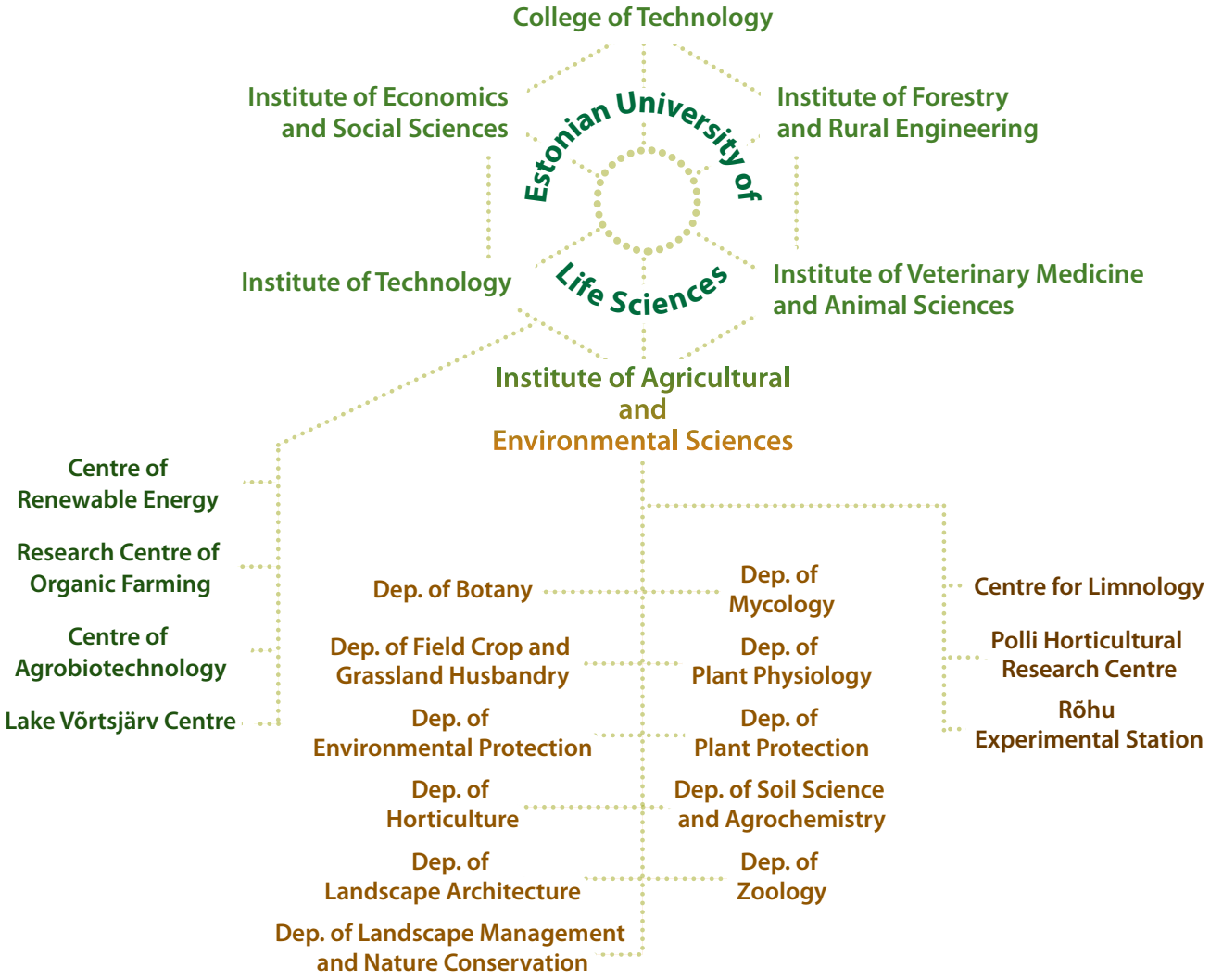
IV. The Institute of Zoology and Botany,

V. The Polli Institute of Horticulture and

VI. The Plant Biotechnology Research Centre EVIKA (which at the time of the merger belonged to the Faculty of Agronomy).

The Institute of Agricultural and Environmental Sciences is the largest of the five institutes, which comprise the Estonian University of Life Science, and attracts 74% of the research financing at the University and approximately 5% of Estonian research financing.

Currently the Institute of Agricultural and Environmental Sciences has 11 departments, two research centres and one experimental station. IAES is also involved in the activities of several interdisciplinary centres in the University.


College of Technology
Institute of Economics and Social Sciences
Institute of Forestry and Rural Engineering
Estonian University of Life Sciences
Institute of Technology
Institute of Veterinary Medicine and Animal Sciences
Institute of Agricultural and Environmental Sciences
Centre of Renewable Energy
Research Centre of Organic Farming
Centre of Agrobiotechnology
Lake Võrtsjärv Centre
Dep. of Botany
Dep. of Mycology
Dep. of Field Crop and Grassland Husbandry
Dep. of Plant Physiology
Dep. of Environmental Protection
Dep. of Plant Protection
Dep. of Horticulture
Dep. of Soil Science and Agrochemistry
Dep. of Landscape Architecture
Dep. of Zoology
Dep. of Landscape Management and Nature Conservation
Centre for Limnology
Polli Horticultural Research Centre
Rõhu Experimental Station

INTERNATIONAL RELATIONS AND COLLABORATION

The Estonian University of Life Science University (EMU) has set as an objective active participation in international networks. Since 1995, EMU has been part of the NOVA-BOVA network that unites agricultural universities and faculties of the Nordic (www.nova-university.org) and Baltic (www.bova-university.org) countries. The aim of NOVA-BOVA has been to enable Master's degree students from the Baltic States to participate in MSc courses in neighbouring countries. Every year EMU arranges at least two intensive courses in English, as do all the other agricultural universities representing each of the Baltic countries.

Between 2002 and 2009, at least a hundred courses have been held. In addition to recognised scientists from European universities attending as lecturers, our academic staff has also lectured at these courses. Since 2003, Baltic PhD students are accepted on the NOVA PhD courses held at the Nordic Universities.

In 1997, EMU joined the Interuniversity Conference of Agricultural and Related Sciences in Europe (ICA) network of European agricultural universities and faculties, which aims to increase the role of universities in the elaboration of agricultural policies in a changing Europe. An important feature of ICA is the organisation's role as an introductory forum for establishing contacts for international student and teacher exchanges. Under the aegis of ICA, EMU has participated in the SOCRATES/ERASMUS Thematic Network Programme since 1999.

SOCRATES/ERASMUS facilitates student and lecturer exchanges throughout Europe.

At present EMU has 105 Erasmus partner universities throughout Europe, which have enabled more than 50 students to study at universities in foreign countries.

EMU currently has two international programs – "Management of biodiversity and multifunctional ecosystems" and "Applied Plant Biology" – both of them are taught by IAES. More information about them can be found on page 57.

There are many European and global networks for the exchange of information and provision of teaching opportunities etc. EMU has been involved with the following since:

1992 - TEMPUS - The trans-European mobility scheme for university studies

1995 - NOVA-BOVA Network - MSc courses for students at Nordic-Baltic agricultural universities

2002/2003 - LE:NOTRE Thematic network on European landscape architecture education

2008-2015 - Doctoral Studies and Internationalisation Programme "DoRa"

Research groups at the Institute of Agricultural and Environmental Sciences participate in a number of projects funded by the European Union Sixth Framework Programme (FP6) and Seventh Framework Programme (FP7) and other international programmes (see p. 49). Participation has resulted in fruitful collaboration with other groups in most European countries as well in the USA.

The main partners are institutions in the UK (e.g. University College London, Natural Environment Research Council - Centre for Ecology and Hydrology), Germany (e.g. Christian Albrechts University of Kiel, University of Kassel, University of Duisburg-Essen), Finland (MTT Agrifood Research Finland), France (L'Institut National de la recherché Agronomique - INRA) as well as institutions in Denmark, Poland, Sweden, Ireland, Netherlands, USA, etc.

IAES also actively promotes organizational co-operations with local entrepreneurs and business institutions in any area where mutual cooperation is possible. One of the aims of IAES is to make research know-how and inventions / innovations more publicly accessible.

Society oriented knowledge and technology in strategic areas enables the Institute to be a key partner for the Ministry of Education and Research, the Ministry of Agriculture, the Ministry of the Environment, Estonian Biofuels Association, Estonian Berry Growers Union, etc. We also work closely with most of Estonian largest companies like AS Estonian Cell, Ramboll Eesti AS, Eesti Energia, Agrochema Eesti OÜ, etc. We also contribute to active co-operation with small and medium-size enterprises.

Examples of development projects in co-operation with Estonian businesses:

- Storage possibilities of Estonian fruits and vegetables in a controlled and modified atmosphere
- Developing the Organic Plant Production Centre at EMU to optimize organic cropping systems with suitable cultures, varieties and cropping systems
- Developing the Competence Centre of Food Production Chain
- Collection and conservation of Plant Genetic Resources of agricultural plants

The Institute of Agricultural and Environmental Sciences has 11 Research and Teaching Departments, two research centres and one experimental station.

Administration

Director: Aret Vooremäe
Director of Studies: Are Selge
Secretary: Alvi Rõigas

- Department of Botany
- Department of Environmental Protection
- Department of Field Crop and Grassland Husbandry
- Department of Horticulture
- Department of Landscape Architecture
- Department of Landscape Management and Nature Conservation
- Department of Mycology
- Department of Plant Physiology
- Department of Plant Protection
- Department of Soil Science and Agrochemistry
- Department of Zoology

Centres

- Polli Horticultural Research Centre
- Centre for Limnology
- Rõhu Experimental Station

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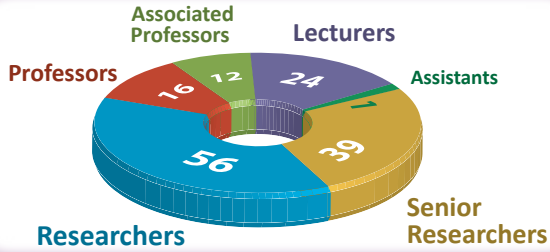
Division of academic staff of Institute of Agricultural and Environmental Sciences (January 2010) (persons)



IMPROVED INFRASTRUCTURE

2007 – Acquisition of a system for interactive visualisation of landscape

2007 – Establishment of measurement and forecast competence for volatile organic compounds

2007 – Refurbishment of the Laboratory of Biofuels

2007-2008 – Experimental technology for experimental stations

2007-2008 – The construction of Polli Centre for Product Development

2007-2008 – The pleasure garden and healing garden at Rõhu

2007-2009 – Intensive modernization and development of laboratories

2008 – Development of technology and management of biogas production in Estonia with pilot equipment

2008 – Improvement of the efficiency of Laboratory of Soil Science and Agrochemistry

2008 – Improvement of the Laboratory of IAES at EMU with a system for determining fibre characteristics

2008 – Refurbishment of the Laboratory of Soil Physics

2008 – The design process of the new main building of Rõhu Experimental Station

2008-2010 – Pilot installation of biogas Instrumentation, Control and Automation

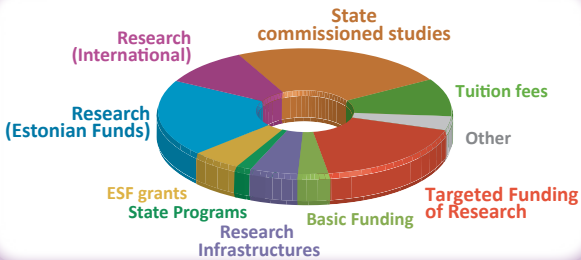
2009 – Development of the Centre for Limnology

2009 – Development of the GoodFruit Project within the Estonian-Latvian programme

THE BUDGET

The annual budget in 2009 of the Institute of Agricultural and Environmental Sciences was approximately 7,3 million Euros. The chart illustrates the major funding sources.

The annual budget in 2009 of the Institute of Agricultural and Environmental Sciences (%)



THE GREEN BUILDING

The University aims at creating a high-quality, motivational working environment for research and studies and continues to develop the Tähtvere campus (see the map on page 61). The general principle of the spatial development is that structural units requiring similar infrastructure are located within the same building. EMU plans to concentrate all so called "green" specialties (agriculture, forestry and environmental sciences) into one building, thus calling it the Green Building. It has therefore been decided to built additional blocks of lecture rooms and renewable natural resources research centre. Environmentally friendly materials and techniques are used when constructing new buildings in the campus. In the case of Green Building we also aim to use rainwater, solar and wind energy and reduce heating costs.

In March 2008, an application was submitted for financial support for construction of the Green Building (a measure for updating the infrastructure of the educational and working environments of research and development institutions and higher education schools).

Project Name: Renewable Natural Resources Science Centre

Total value of application: 4.6 million Euros

Current Status: After the application was approved, an architectural competition took place in 2008 and currently (2010) the design process is in progress.

The idea of the Green Building gave the University stimulus to expand environmentally friendly mentality of actions across the whole university.

THE GREEN UNIVERSITY INITIATIVE

@ http://www.emu.ee/en/general-information/green-university-initiative/

The mission of our university is to foster sustainable use of natural resources through knowledge based education. In order to support this concept we have created the Green University Initiative.

The initiative involves all the students and staff in EMU. We believe that EMU should be open to new ideas and focus on new environmentally friendly solutions in our everyday life. Developing The Green University is a long term process that also needs to be integrated with our educational and scientific activities.

The standards of the Initiative are applied to a broad range of EMU related areas, such as: waste, food, transport, planning, energy and general awareness. We have, for example, mapped the bicycle paths and parking places near the university campus; we are organising a supply of organically grown products for our cafeterias and are also including eco-building principles into the new university building planned for the future.

FOREIGN PEOPLE WORKING IN IAES

Zhihong Sun

Research topic: Influence of global climate change on emission of volatile organic compounds from plants

CHINA

GERMANY

Steffen M. Noe, Dr.rer.nat.

Research topics: Integrated atmosphere-biosphere interaction measurements on ecosystem scale

GERMANY

Katja Hüve, Dr.rer.nat

Research topics: Plant physiology, especially photosynthesis, plant stress physiology and connected emissions of plant volatile compounds

GERMANY

Prof. Friedrich Kuhlmann

Research topic: Contemporary Cultural Landscapes, more specfically Image Theory as a theoretical basis for perception and design in Urban Landscapes

Prof. Simon Bell

UK

Research topics: Landscape perception, cultural landscapes, outdoor recreation, landscape and health

Leila Pazouki

Research topics: Molecular plant physiology, plant genomics and assessment of genetic diversity in plants

IRAN

COLOMBIA

Isabel Diaz Forero

Research topics: Abiotic and biotic markers for the evaluation of habitat quality

Prof. Dr. Ingrid Helvi Williams

Research topics: Oilseed rape entomology, apiculture, biocontrol, insect behaviour

UK

Mario Luna Del Risco

Research topics: Kinetics and efficiency of biogas production from crops and wastes

COLOMBIA

SPAIN

Miguel Portillo Estrada

Research topic: Chemical, structural and climatic controls on litter decomposition (Biosciences, Plant Physiology)

Prof. Anders Kvarnheden

Research topic: plant virology

SWEDEN

SPAIN

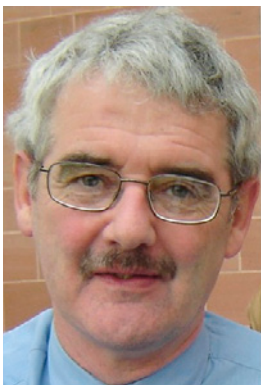
Miguel Villoslada

Research topics: Geoinformatics and virtual landscape creation (Landscape Theatre)

Lucian Copolovici, Dr

Research topics: Plant stress ecophysiology and VOC emission

ROMANIA



UK

Roger Evans, Dr

Research topics: agriculture, tourism, community, business

Lorenzo Pecoraro

Research topics: Orchid mycorrhiza

ITALY

CHINA

Yunchun Zhang

Research topics: trade-off between sexual reproduction and clonal growth in natural heterogenous habitats

DEPARTMENT OF BOTANY

Department of Botany focuses on Estonian flora, we aspire to having full knowledge on our local species, habitats and their dynamics. Special attention is paid on rare species and habitats, but also to invasive foreigners.

Research and studies

- **Evolution, phylogeography, taxonomy and population biology.**

  Isozyme diversity in various agriculturally important plant species and their wild relatives belonging to the grass legume genera are studied. DNA markers are used to understand the diversity and evolution of Orchidaceae and other rare and protected species in Estonia. Long-term population dynamics is studied in several species of Orchidaceae and Ophioglossaceae (Botrychium). Reproduction biology is studied in several threatened Carex species as well in Ligularia sibirica, Swertia perennis, Coeloglossum viride, etc.

- **Plant communities**

  Dynamics, diversity and conservation of plant communities; vegetation change in species rich meadows in response to abandonment; restoration, and management of habitats are the key words of our studies.

- **Bioenergy**

  Research in experimental willow plantations with former clones; analysis of biomass of former grasslands.

- **Aerobiology**
- **Nature tourism**

Recent publications

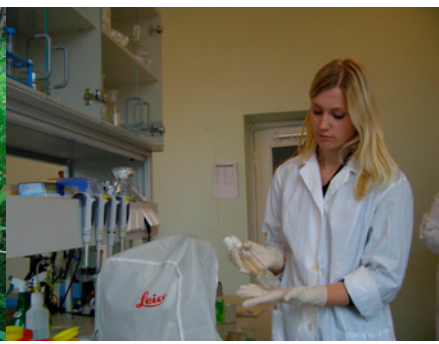
Sammul, M., Kull, T., Lanno, K., Otsus, M., Mägi, M., Kana, S. 2008. Habitat preferences and distribution characteristics are indicative of species long-term persistence in the Estonian flora. Biodiversity and Conservation, 17, 3531–3550.

Shefferson, R.P., Kull, T., Tali, K. 2005. Adult whole-plant dormancy induced by stress in long-lived orchids. Ecology, 86(11), 3099–3104.

Ööpik, M., Kukk, T., Kull, K., Kull, T. 2008. The importance of human mediation in species establishment: Analysis of the Alien Flora of Estonia. Boreal Environment Research, 13, 53–67.

Jaaska, V., Leht, M. 2007. Phylogenetic relationships between and within sections Hypechusa, Narbonensis and Peregrinae of genus Vicia (Fabaceae) based on evidence from isozymes and morphology. Central European Journal of Biology, 2(1), 137–155.

Heinsoo, K., Melts, I., Sammul, M., Holm, B. 2010. The potential of Estonian semi-natural grasslands for bioenergy production. Agriculture Ecosystems & Environment, 137(1–2), 86–92.



Staff

Tiiu Kull – Professor, PhD, Head of Department, Botany and ecology, distribution and population biology of threatened species, biodiversity conservation

Vello Jaaska – Senior Researcher, DSc, Genetic diversity and phylogenetic affinities among different Fabaceae and Poaceae by isozyme markers.

Malle Leht – Senior Researcher, PhD, Taxonomy (especially Rosaceae and Fabaceae)

Marek Sammul – Senior Researcher, PhD, Plant ecology – clonal propagation in plants, interspecific interactions in plant communities, ecology and diversity of semi-natural communities, restoration ecology.

Katrin Heinsoo – Senior Researcher, PhD, Sustainable biomass production for bioenergy, bioenergy in semi-natural meadows, short rotation coppice, vegetation filter

Kadri Tali – Senior Researcher, PhD, Reproduction and survival of Estonian orchids

Merit Otsus – Senior Researcher, PhD, Floristic changes of Estonian species-rich plant communities

Kalevi Kull – Senior Researcher, PhD, Theoretical ecology

Roger Evans – Specialist in nature tourism, PhD

Thea Kull – Researcher, MSc, Distribution and ecology of Carex species

Toomas Kukk – Senior curator, MSc, Vascular plants

Mare Leis – Curator, Bryophytes

Lea Sudakova – Lecturer, MSc, Nature tourism

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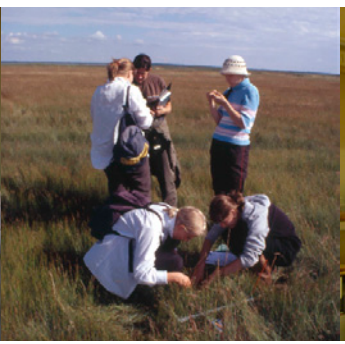

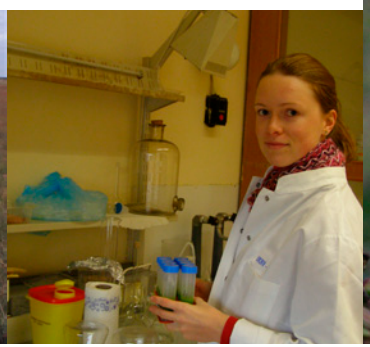

DEPARTMENT OF ZOOLOGY

The department is devoted to study and teach different aspects of animal biota: from systematics to ecology and conservation.

Research and studies

The aim of the Department is to combine laboratory experiments with extensive studies of real processes in nature of the following:

- Ecology and conservation of bird species (Spotted Eagle, Great Snipe, Southern Dunlin, Common Crane, waders etc.)
- Long-term population studies of Common Gull
- Systematics of Diptera and Lepidoptera
- Colour variability and use as a taxonomic characters in insects, plants and fungi

The Department maintains an extensive zoological collection, mainly of insects.

Recent publications

Brommer, J.E., Rattiste, K. 2008. "Hidden" reproductive conflict between mates in a wild bird population. Evolution, 62(9), 2326–2333.

Kurina, O. 2008. Cluzobra matilei sp.n. from French Guyana, with notes on congeners (Diptera: Mycetophilidae), Zootaxa, 1874, 63–68.

Saether, S.A., Fiske, P., Kalas, J.A., Kuresoo, A., Luigujoe, L., Piertney, S.B., Sahlman, T., Höglund, J. 2007. Inferring local adaption from Qst-Fst comparisons: neutral genetic and quantitative trait variation in European populations of great snipe. Journal of Evolutionary Biology, 20, 1563–1576.

Väli Ü., Dombrovski, V., Treinys, R., Bergmanis, U., Daroczi, S., Dravecky, M., Ivanovski, V., Lontkowski, J., Maciorowski, G., Meyburg, B.-U., Mizera, T., Zeitz, R., Ellegren, H. 2010. Widespread hybridization between the Greater Spotted Eagle Aquila clanga and the Lesser Spotted Eagle Aquila pomarina (Aves: Accipitriformes) in Europe. Biological Journal of the Linnean Society, 100, 725–736.

Õunap, E., Viidalepp, J. 2009. Description of Crypsiphona tasmanica sp.nov. (Lepidoptera: Geometridae: Geometrinae), with notes on limitations in using DNA barcodes for delimiting species. Australian Journal of Entomology, 48(2), 113–124.

Staff

Olavi Kurina - Senior Researcher, PhD, Head of Department, Systematics and faunistics of Diptera (Sciaroidea)

Ülo Väli - Senior Researcher, PhD, Population ecology and conservation of Spotted Eagles

Jaan Viidalepp - Senior Researcher, PhD, Systematics of Lepidoptera (Geometridae)

Kalev Rattiste - Researcher, PhD, Long-term population studies of the Common Gull

Alo Vanatoa - Researcher, MSc, Colour variability and use as taxonomic characters in insects, plants and fungi, insect physiology

Andres Kuresoo - Researcher, MSc, Ecology and conservation of the Great Snipe and water-birds, migration of birds

Leho Luigujõe - Researcher, Ecology and conservation of Great Snipe and waterbirds, migration of birds.

Erki Õunap - Senior laboratory assistant, PhD, Systematics and faunistics of Lepidoptera

Hannes Pehlak - Senior laboratory assistant, MSc, Ecology of waders

Rein Karulaas - Senior laboratory assistant, technical work in inscet collection

Tõnu Kesküla - Laboratory assistant, databasing, technical work in inscet collection

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Holotype of *Ramitia obliquelineata* Viidalepp, 1988 in entomological collection

DEPARTMENT OF FIELD CROPS AND GRASSLAND HUSBANDRY

Department is only teaching unit in Estonia who is responsible for bachelor, master and doctoral level studies in Field Crops and Grasslands. We aspire to study and teach different aspects of plant producton, from environment-saving management of arable and grassland systems to efficient utilizaton of yield.

Research and studies

- Food, feed and energy crops cultivation, environmental impact of agrotechnologies, yield quality
- Long term impacts of different land use systems – conventional versus organic farming
- Nutrient cycling in field and grassland systems
- Utilization of liquid manure (slurry) and sewage sludge to fertilize grassland, arable and energy crops and their impacts on yield quality and the environment
- Green manure crops in conventional and organic farming systems, regulating humus status, nutrient balance in soil
- Internet based Decision Support System for plant protection
- Agricultural advisory systems and delivery of scientific knowledge

Recent publications

Alaru, M., Laur, Ü., Eremeev, V., Reintam, E., Selge, A., Noormets, M. 2009. Winter triticale yield formation and quality affected by N rate, timing and splitting. Agricultural and Food Science, 18(1), 76–90.

Eremeev, V., Jõudu, J., Lääniste, P., Mäeorg, E., Makke, A., Talgre, L., Lauringson, E., Raave, H., Noormets, M. 2008. Consequences of pre-planting treatments of potato seed tubers on leaf area index formation. Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 58(3), 236–244.

Lääniste, P., Jõudu, J., Eremeev, V., Mäeorg, E. 2008. Effect of sowing date and increasing sowing rates on plant density and yield of winter oilseed rape (Brassica napus L.) under Nordic climate conditions. Acta Agriculturae Scandinavica, Section B – Plant Soil Science, 58:4, 330-335.

Raave, H., Kapak, S., Orupõld, K. 2007. Phytotoxicity of oil shale semi-coke and its aqueous extracts: a study by seed germination bioassay. Oil Shale, 24(1), 59–72.

Noormets, M., Olson, A.R. 2006. Bud-autogamy in the Velvet-Leaf Blueberry, Vaccinium myrtilloides Michx. Canadian Journal of Plant Sciences, 1, 245–250.

Staff

Merrit Noormets - Senior Researcher, PhD, Head of Department, Plant production

Juhan Jõudu - Prof. Emeritus, PhD, Field crop husbandry, potato, oilseed rape

Are Selge - Assoc. Prof. DSc, Director of Studies, Estonian agriculture, state regulation of the agricultural sector, advisory service and systems, grassland science (special course for PhD students)

Rein Viiralt - Prof. Emeritus, PhD, Senior specialist, Grassland technologies and forage production, grassland science (special course for PhD students), grassland nutrition and fertilizer application; irrigation of grasslands

Argaadi Parol - Lecturer, PhD, Botany with fundamentals of agronomy, forage plants, grass intake experiments with dairy and beef cattle.

Enn Lauringson - Assoc. Prof., DSc, Land cultivation, soil management, green manures, weed management

Jaan Kuht - Assoc. Prof. and Senior specialist, PhD, Sustainable crop husbandry, soil compaction, soil tillage and treatment

Henn Raave - Researcher, DSc, Lawns, grassland science (special course for PhD students), bioenergy (energy hay)

Arvo Makke - Lecturer, MSc, Processing of field products and quality, field crop husbandry

Indrek Keres - Lecturer and Researcher, MSc, Lawns, Estonian agriculture, regulation of agriculture and environment in European Union

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Liina Talgre - Researcher, MSc, Soil management, green manures, Internet based Decision Support System for plant protection

Maarika Alaru - Researcher, DSc, Winter crops, triticale, bioenergy, field crop husbandry

Karin Kauer - Researcher, MSc, Nutrient cycling in grasslands, organic matter decomposition

Peeter Lääniste - Lecturer, MSc, Plant breeding, seed science, seed production, field crop husbandry

Ruth Lauk - Lecturer and Specialist, PhD, Field crop husbandry, plant science, bioenergy

Vyacheslav Eremeev - Researcher, PhD, Field crop husbandry, crop rotation, organic and conventional farming, potato cultivation

Toomas Laidna - Lecturer, MSc, Agricultural botany, grassland science

DEPARTMENT OF MYCOLOGY

The department is devoted to study and teach different aspects of mycology: from systematics to ecology and conservation. Special attention is paid on rare species of Estonia and endophytic fungi

Research and studies

The Department administers several specimen collections for the purposes of research and teaching:

TAAM, Estonia's largest and most important collection of fungi, established in 1950 (183,000 specimens)

EEA, collection of parasitic microfungi and species growing on cultivated plants established in 1922 (35,000 specimens) and

TFC, fungal pure culture collection, established in 1970 (400 species and 2,000 strains).

Mycological collection - TAAM - was founded in 1950 at the Institute of Zoology and Botany (IZB) of the Estonian Academy of Sciences. The total number of specimens in the collection is approximately 183,000. The herbarium is one of the most important collections of macromycetes of the northern part of Eurasia, and the most complete collection of Aphyllophoraceous fungi of Siberia and the Russian Far East. Mycophilous fungi are well represented, too. In recent decades, collecting trips have been made to other European countries, North America (including Greenland), Africa, Southern Asia and Australia.

The information in the Estonian National Register of Species (2008) about 5500 species and information about the distribution and need of protection of the 167 fungal species on the Estonian Red Data List (2008) are based mainly on this herbarium collection. For taxonomy and identification of fungi, a molecular biology laboratory has been established for DNA analysis. Correctly identified specimens (especially type specimens) and extracted from these DNA are important etalons to identify plant diseases, food pollutants, etc. The preservation of reference specimens is one of our main goals.

In cooperation with the Museum of Natural History of the Tartu University, about over 50,000 specimen records have been included into the joint database of the Estonian biological collections.

Mycological collection - EAA includes about 30,000 specimens of parasitic microfungi and species growing on cultivated plants. 18,700 specimens have been included into the joint database of the Estonian fungal collections kept at the Tartu University Nature Museum.

Collection of fungal living cultures - TFC - presently contains more than 2,000 strains representing more than 400 fungal species from almost the whole world, including both saprobiotic and biotrophic fungi, especially wood-rotting fungi. The collection has a good representation of isolates of some species from the genera Phellinus, Hypomyces, Nectria, Peziza, as well as Hymenochaete. Data about the isolates in the culture collection are available from an online database.

Recent publications

Gregory, T.R., Nicol, J.A., Tamm, H., Kullman, B., Kullman, K., Leitch, I.J., Murray, B.G., Kapraun, D.F., Greilhuber, J., Bennett, M.D. 2007. Eukaryotic genome size databases. Nucleic Acids Research Database Issue, D332–D338.

Hibbett, D.S., Binder, M., Bischoff, J.F., Blackwell, M., Cannon, P.F., Eriksson, O.E., Huhndorf, S., James, T., Kirk, P.M., Lücking, R., Thorsten Lumbusch, H., Lutzoni, F., Matheny, P.B., Mclaughlin, D.J., Powell, M.J., Redhead, S., Schoch, C.L., Spatafora, J.W., Stalpers, J.A., Vilgalys, R., Aime, M.C., Aptroot, A., Bauer, R., Begerow, D., Benny, G.L., Castlebury, L.A., Crous, P.W., Dai, Y.-C., Gams, W., Geiser, D.M., Griffith, G.W., Gueidan, C., Hawksworth, D.L., Hestmark, G., Hosaka, K., Humber, R.A., Hyde, K.D., Ironside, J.E., Kõljalg, U., Kurtzman, C.P., Larsson, K.-H., Lichtwardt, R., Longcore, J., Miadlikowska, J., Miller, A., Moncalvo, J.-M., Mozley-Standridge, S., Oberwinkler, F., Parmasto, E., Reeb, V., Rogers, J., Roux, R.G., Ryvarden, L., Sampaio, J.P., Schüssler, A., Sugiyama, J., Thorn, R.G., Tibell, L., Untereiner, W.A., Walker, C., Wang, Z., Weir, A., Weiss, M., White, M.M., Winka, K., Yao, Y.-J., Zhang, N. 2007. A higher-level phylogenetic classification of the Fungi. Mycological Research, 111, 509–547.

Larsson, K.H., Parmasto, E., Fischer, M., Langer, E., Nakasone, K.K., Redhead, S.A. 2007. 2006. Hymenochaetales: a molecular phylogeny for the hymenochaetoid clade. Mycologia, 98 (6), 926–936.

Raitviir, A. 2008. The Helotiales of the Magadan and Chukotka areas of the Russian Arctic. Rune D. Okland (ed.). Sommerfeltia, 31, 179–190.

Tamm, H. Põldmaa, K. Kullman, B. 2010. Phylogenetic relationships in genus Geopora (Pyronemataceae, Pezizales). Mycological Progress, 9(4), 509–522.

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Staff

Bellis Kullman - Senior Researcher, PhD, Head of Department, Biosystematics (Ascomycetes, Pezizales, taxonomy, speciation, genomics, fungal endophytes)

Erast Parmasto - Academician, Senior Researcher, DSc, Taxonomy and spreading biology of fungi, use of biometrics in taxonomy

Kuulo Kalamees - Specialist, DSc, Biosystematics and bio-physiology

Kadri Pärtel - Curator, MSc, Biosystematics

Anne-Liis Sõmermaa - Specialist, PhD, Diversity and dispersion of lichens and ascomycetes

Ilmi Parmasto - Curator, PhD, Biosystematics and bio-physiology

Indrek Sell - Specialist, MSc, Systematics and ecology of wood-rotting fungi

Anu Kollom - Curator of TFC

Kristina Kasekamp - MSc, Laboratory assistent, fungal endophytes

Triin Varvas - MSc, Laboratory assistent, fungal endophytes

Irma Zettur - MSc, Laboratory assistent, biosystematics

DEPARTMENT OF PLANT PHYSIOLOGY

The key research area of the Department of Plant Physiology is plant response to biotic and abiotic stresses. In frames of this general topic, the department conducts interdisciplinary work on plant biology, plant stress ecophysiology, modelling of biological processes, molecular biology and (bio)chemistry. The team lead by Prof. Ülo Niinemets is in large part established in the beginning of 2006 and has since then been in the phase of rapid development. Currently, the multinational team consists of researchers from Estonia, Germany, Romania, Iran, Spain and China, with group members' specialities covering biology, ecology, chemistry, physics and mathematics. The lab has been highly productive with more than 60 international peer-reviewed papers produced during the last five years and has been very successful in obtaining funding from national (target-funded project "Plant stress ecophysiology", grants from the Estonian Science Foundation, and the Estonian Environmental Investment Center) and international (EU 6th framework programme Nitroeurope, a project from Human Frontiers of Science Program, www.hfsp.org, projects from the European Science Foundation, VOCBAS programme) sources.

Research and studies

While all plants exchange CO2 and O2 during photosynthesis and respiration, most plants also have the ability to emit volatile organic compounds (BVOCs) from different organs such as flowers, fruits and leaves. Volatile isoprenoids – isoprene (5 carbon atoms, C5) and volatile terpenes consisting of isoprene building blocks, (monoterpenes, C10) and sesquiterpenes (C15) – form a major part of plant-generated BVOC emissions. The characteristic plant emissions consist of a complex blend of chemically heterogeneous volatile isoprenoids. In addition, upon stress, plants release typical stress marker compunds such as volatile products of the lipoxygenase pathway (green leaf volatiles), NO, ethylene, methylsalicylate and methyljasmonate. The research conducted at the Department is currently mainly focused on BVOCs released in response to various stresses, using the emitted compounds as stress markers with the major aim to develop quantitative stress dose vs. plant response relationships.

In addition, the Department studies the role of constitutive and induced BVOC emissions on large-scale atmospheric processes. Globally, BVOC emissions, about 1150 Tg (C) per year, are estimated to be approximately ten times higher than the volatile organic compound emissions due to human activity. The largest BVOC sources are forests, spanning from tropical to boreal biomes. Also biomass burning is a large source on global scale, leading to emissions of numerous BVOCs, including aromatic hydrocarbons, nitriles, and oxygenated compounds. BVOCs play a significant role in tropospheric chemistry in urban, rural, and remote areas. In particular, they are involved in the formation and growth of atmospheric aerosol particles. Aerosols are an important factor in the climate system, either directly through the absorption and scattering of solar radiation, or indirectly by acting as cloud condensation nuclei. In addition, BVOCs may have an effect on the optical properties of aerosol particles. Thus, quantitative understanding of the plant capacity to release BVOC is highly relevant in simulating large scale earth processes.

In addition to research, the lab is actively participating in graduate teaching program of PKI and also participates in the international NORDPLUS master study program ABS (Atmosphere-Biosphere Studies) – a Nordic countries program including Estonia, Finland, Sweden and Denmark.

Lab facilities

The lab has invested more than 10 million EEK during 2006-2009 for updating the research infrastructure. Main equipment presently available includes Proton Reaction Transfer Mass Spectrometer, Shimadzu QP2010 plus Gas chromatograph with mass detector and thermodesorber (GC - MS), Portable photosynthesis system (GFS-3000) and Imaging fluorometers, gas chromatograph with flame ionization detector (GC

FID), isoprene chemiluminescence analyzer, NO-NO2-NOx chemiluminescence analyzer, ozone analyzer, PCR and real time PCR systems, Metek Ultrasonic anemometer, UV-VIS spectrophotometer. Parallel computing cluster, Apple XServe, 32 processors.

Recent publications

Copolovici L., Niinemets Ü. 2010. Flooding induced emissions of volatile signalling compounds in three tree species with differing waterlogging tolerance. Plant Cell and Environment, 33, 1582–1594.

Hallik L., Niinemets Ü., Wright I.J. 2009. Are species shade and drought tolerance reflected in leaf-level structural and functional differentiation in Northern Hemisphere temperate woody flora? The New Phytologist, 184, 257-274.

Hüve K., Bichele I., Rasulov B., Niinemets Ü. 2010. When it is too hot for photosynthesis: heat-induced instability of photosynthesis in relation to respiratory burst, cell permeability changes and H2O2 formation. Plant, Cell and Environment, 33, In Press.

Niinemets Ü. 2010 Mild versus severe stress and BVOCs: thresholds, priming and consequences. Trends in Plant Science, 15, 145–153.

Noe S.M., Niinemets Ü., Schnitzler J.-P. 2010. Modeling the temporal dynamics of monoterpene emission by isotopic labeling in Quercus ilex leaves. Atmospheric Environment, 44, 392–399

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Steffen Noe - Senior Researcher, Dr.rer.nat, Modelling physiological processes

Lucian Copolovici - Researcher, PhD, Plant stress physiology, chemistry

Olav Keerberg - Senior Researcher, DSc (biology), Plant physiology

Tiit Pärnik - Senior Researcher, DSc, Plant physiology

Astrid Kännaste - Researcher, PhD, Plant stress physiology, chemistry

Lea Hallik - Researcher, PhD, Ecophysiology

Mari Tobias - Researcher, MSc, Ecophysiology

DEPARTMENT OF PLANT PROTECTION

The department is responsible for teaching, research and extension activities on national issues related to plant protection. Our priority is to develop environmentally friendly technologies enhancing the abundance of natural enemies and depressing the incidence of plant pests.

Recent publications

Karise, R., Kuusik, A., Mänd, M., Metspalu, L., Williams, I.H., Hiiesaar, K., Luik, A., Muljar, R., Liiv, K. 2010. Gas exchange patterns of bumble bee foragers before and after exposing to lowered temperature. Journal of Insect Physiology, 56 (2), 529–535.

Merivee, E., Must, A., Luik, A., Williams, I. 2010. Electrophysiological identification of hygroreceptor neurons from the antennal dome-shaped sensilla in the ground beetle Pterostichus oblongopunctatus. Journal of Insect Physiology, 56, 1671–1678.

Runno-Paurson, E., Fry, W.E., Remmel, T., Mänd, M., Myers, K.L. 2010. Phenotypic and genotypic characterisation of Estonian isolates of Phytophthora infestans in 2004-2007. Journal of Plant Pathology, 92 (2), 375–384.

Toome, M., Randjärv, P., Copolovici, L., Niinemets, Ü., Heinsoo, K., Luik, A., Noe, S.M. 2010. Leaf rust induced volatile organic compound signalling in willow during the infection. Planta, 232, 235–243.

Hiiesaar, K., Williams, I., Luik, A., Metspalu, L., Muljar, R., Jõgar, K., Karise, R., Mänd, M., Svilponis, E., Ploomi, A. 2009. Factors affecting cold hardiness in the small striped flea beetle, Phyllotreta undulata. Entomologia Experimentalis et Applicata, 131, 278–285.

Research and studies

Research efforts of the Department of plant protection are directed towards both fundamental and applied results. The most important subjects under research include following issues:

1. Ecology and behaviour of pest and beneficial insects:

- Influence of host plant varieties, fertilization and plant protection measures on the ecology, physiology and behaviour of key pests and their natural enemies
- Influence of food quality and environmental conditions on the physiological state and vitality of pests and beneficial insects
- Influence of exposure to sub-lethal doses of pesticides on host–insect–parasitoid interactions
- Study of the ecology, behaviour and distribution of pests, their natural enemies and pollinators in relation to the landscape

2. Epidemiology of plant pathogens on field crops

3. Insect behaviour and sensory responses:

- Morphology and functioning of antennal sensillae
- Impact of external chemical and physical stimuli on the searching behaviour of insects

4. Conservation of beneficial insects within integrated pest management strategies

Staff

Marika Mänd - Professor, PhD, Head of Department, Social insects, pollinators, environmentally friendly plant protection

Anne Luik - Professor, PhD, Plant-insects interactions, ecophysiology of insects, organic and sustainable cropping systems

Anders Kvarnheden - Visiting Professor, PhD, Plant virology

Katrin Jõgar - Associate Professor, PhD, Insects physiology

Eve Veromann - Associate Professor, PhD, Beneficial insects, parasitoids, organic and sustainable cropping systems

Külli Hiiesaar - Senior Researcher, PhD, Biological control, biopesticides, insects' hibernation physiology

Aare Kuusik - Senior Researcher, PhD, Insects physiology, pathophysiology

Enno Merivee - Senior Researcher, PhD, Insect sensor physiology, insects behaviour

Ants-Johannes Martin - Senior Researcher, PhD, Ecophysiology of social insects

Luule Metspalu - Senior Researcher, PhD, Insects physiology, pathophysiology, biological control

Ingrid Williams - Senior Researcher, PhD, Applied entomology, pollinators, parasitoids

Reet Karise - Researcher, PhD, Foraging behaviour of bumble bees, effects of pesticides

Angela Ploomi - Researcher, PhD, Ecology and physiology of insects, biopesticides

Eve Runno-Paurson - Lecturer, PhD, Phytopathology

Anne Must - Researcher, PhD, Insect sensory physiology, insects behaviour

Märt Kruus - Curator, MSc, Insects systematics

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DEPARTMENT OF SOIL SCIENCE AND AGRO-CHEMISTRY

Our mission is to provide academic education and research in soil science and its sub-disciplines. We are aimed to advance basic understanding and practical management of soils in natural and agricultural ecosystems and disseminate knowledge about sustainable use of soil resources.

Research and studies

- Soil properties, productivity and fertility
- Sustainable use of soil resources
- Soil organic carbon, humus status of soils, biochemically active organic compounds in soils
- Soil degradation (compaction)
- Nutrient cycles and plant nutrition: nutrients in plant-soil-environment systems, efficiency of fertilization, balanced fertilization
- Classification and evaluation of soils
- Soil information systems, digital soil maps, pedoecological models for land use planning
- Rational land use, development of spatial agro-economic decision support system

Recent publications

Kukk, L., Astover, A., Muiste, P., Noormets, M., Roostalu, H., Sepp, K., Suuster, E. 2010. Assessment of abandoned agricultural land resource for bio-energy production in Estonia. Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 60(2), 166–173.

Kõlli, R., Astover A., Noormets, M., Tõnutare, T., Szajdak, L. 2009. Histosol as an ecologically active constituent of peatland: a case study from Estonia. Plant and Soil, 317(1–2), 3–17.

Reintam, E., Trükmann, K., Kuht, J., Toomsoo, A., Teesalu, T., Köster, T., Edesi, L., Nugis, E. 2008. Effect of Cirsium arvense L. on soil physical properties and crop growth. Agricultural and Food Science, 17(2), 153–164.

Csathó, P., Sisák, I., Radimszky, L., Lushaj, S., Spiegel, H., Nikolova, M.T., Nikolov, N., Cermák, P., Klir, J., Astover, A., Karklins, A., Lazauskas, S., Kopiński, J., Hera, C., Dumitru, E., Manojlovic, M., Cuvardić, M., Bogdanović, D., Torma, S., Leskosek, M., Khristenko, A. 2007. Agriculture as a source of phosphorus causing eutrophication in Central and Eastern Europe. Soil Use and Management, 23(s1), 36–56.

Reintam, E., Köster, T. 2006. The role of chemical indicators to correlate some Estonian soils with WRB and Soil Taxonomy criteria. Geoderma, 136, 199–209.

Staff

Alar Astover - Associate Professor, PhD, Head of Department, Soil models, fertilizer optimization, agricultural land use planning and economics

Endla Reintam - Associate Professor, PhD, Soil physics (compaction), agro-ecology

Enn Leedu - Associate Professor, DSc, Soil reclamation, soil fertility

Raimo Kõlli - Senior Researcher, DSc, Prof. Emeritus, Soil organic carbon, pedo-ecological aspects of soil use and protection, humus forms

Avo Toomsoo - Lecturer, MSc, Plant nutrition and balanced fertilization, soil agrochemical properties

Indrek Tamm - Lecturer, MSc, Agricultural land use economics, efficiency of fertilizer use

Liia Kukk - Specialist, MSc, Bioenergy crops, efficiency analysis

Helis Rossner - Specialist, MSc, Plant nutrition, soil fertility, efficiency analysis

Elsa Suuster - Specialist, MSc, Soil models, soil organic carbon, digital soil maps

Triin Teesalu - Specialist, MSc, Plant nutrition and balanced fertilization

Soil Museum

Collections are used in teaching agro-chemistry and soil and environmental sciences, as well in scientific research. Currently 133 soil monoliths are viewable. The soil archive, including over 20,000 samples acquired from national soil monitoring, long-term field experiments, research areas and transects, forms the most valuable scientific part of museum. Other collections concern minerals, soil parent materials, fertilizers, soil maps etc.

Soil Science Laboratory

The laboratory aims to provide technical support for fulfilling various research projects in areas of soil science, agronomy and ecology. Highly qualified staff (Imbi Albre, Raja Kährik, Tõnu Tõnutare) ensures successful operation and development of the laboratory. In recent years the total investments on new apparatus have been over 400,000€.

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

The department provides academic education and performs research on human impact on environment and environmental management. We focus on the studies of air quality, matter cycling in soils, insects as indicators for habitat quality, habitats and landscapes, environmental management, energetic biomass conversion. The department has laboratory of Bio- and Environmental Chemistry.

Research and studies

- Impact of human activity on biosphere, habitats and landscapes
- Environmental changes in Estonia in the context of global changes
- Habitat and landscape quality
- Air quality
- Matter cycling in soils
- Insects as biomarkers
- Changes in semi-natural communities
- Environmental management: environmental impact assessment, environmental economics, analysis of environmental risks
- Environmental planning based on landscape ecology
- Ecological engineering
- Energetic biomass conversion
- Biogas studies

Recent publications

Heinlaan, M., Ivask, A., Blinova, I., Dubourguier, HC., Kahru, A. 2008. Toxicity of nanosized and bulk ZnO, CuO and TiO2 to bacteria Vibrio fischeri and crustaceans Daphnia magna and Thamnocephalus platyurus. Chemosphere, 71(7), 1308–1316.

Meier, K., Kuusemets, V., Luig, J., Mander, U. 2005. Riparian buffer zones as elements of ecological networks: Case study on Parnassius mnemosyne distribution in Estonia. Ecological Engineering, 24(5), 531–537.

Orru, H., Kimmel, V., Kikas, U., Soon, A., Kunzli, N., Schins, R.P.F., Borm, P.J.A., Forsberg, B. 2010. Elemental composition and oxidative properties of PM2.5 in Estonia in relation to origin of air masses - results from the ECRHS II in Tartu. Science of the Total Environment, 408 (7), 1515–1522.

Ostonen, I., Püttsepp, Ü., Biel, C., Alberton, O., Bakker, M.R., Lõhmus, K., Majdi, H., Metcalfe, D., Olsthoorn, A., Pronk, A., Vanguelova, E., Weih, M., Brunner, I. 2007. Specific root length as an indicator of environmental change. Plant Biosystems, 141(3), 426–442.

Ööpik, M., Kukk, T., Kull, K., Kull, T. 2008. The importance of human mediation in species establishment: Analysis of the Alien Flora of Estonia. Boreal Environment Research, 13, 53–67.

Staff

Valdo Kuusemets - Professor, PhD, Head of Department, Landscape ecology, ecological engineering

Veljo Kimmel - Senior Researcher, PhD, Air quality monitoring and assessment, emission measurements and inventories

Ülle Püttsepp - Researcher, PhD, Soil and root ecology, fine-root parameters, decomposition

Kaja Orupõld - Researcher, PhD, Environmental chemistry

Aarne Luud - Researcher, PhD, Landscape ecology and GIS

Jaan Luig - Researcher, MSc, Entomology, faunistics of various insect groups in northern Europe; biosystematics and –physiology of Hymenoptera and Lepidoptera

Merle Ööpik - Lecturer, MSc, Biological invasions in context of alien flora; Ecology of different invasive plant species

Kadri Kask - Lecturer, MSc, State of the Environment and indicator species

Aija Kosk - Lecturer, MSc, Environmental policy, environmental economics

Ave Liivamägi - Technician, MSc, Insects as bioindicators

Milvi Purgas - Chemist, MSc, Chemical analyses

Liina Nurk - MSc, Laboratory assistant, Chemical analyses, biogas production

Argo Normak - MSc, Senior specialist, Renewable energy

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DEPARTMENT OF LANDSCAPE MANAGEMENT AND NATURE CONSERVATION

Department of Landscape Management and Nature Conservation focuses on the integrated and multidisciplinary study of landscapes and innovative practices in nature conservation. The members of research team work together in building theory and developing knowledge of landscape patterns and processes, landscape values and functions, developing integrative management tools (methodologies on landscape planning, monitoring, evaluation etc), and making them applicable to real landscape situations. Special attention is paid on land-use change, landscape management and regional development, but also to landscape ecology and ecology of bird species and communities.

Staff

Kalev Sepp - Professor, PhD, Head of Department, Landscape ecology and management, nature conservation

Aivar Leito - Senior Researcher, PhD, Ecology of bird species and communities

Are Kaasik - Researcher, MSc, Landscape ecology, land use and landscape change, ecological networks

Jaak Kliimask - Lecturer, MSc, Regional development, planning and policy

Karin Kruusmaa – Lecturer, MSc, Project management

Anne Kull - Lecturer, MSc, GIS analysis, modelling of soil erosion and nutrients flows, cartography

Maaria Semm - Lecturer, MSc, Landscape management

Eva-Liis Tuvi - Lecturer, MSc, Nature conservation, vascular plant conservation

Ene Hurt - Specialist, MSc, GIS and landscape ecology

Henri Järv - Technican, MSc, Project management

Kristel Kirsimäe - Head of information centre

Janar Raet - Specialist, MSc, GIS, land use, landscape monitoring

Miguel Villoslada Peciña - GIS specialist, MSc, Multi-media, visitor survey at protected areas

Research and studies

- Assessment of landscape values and functions
- Ecological responses of species to land use change
- Environmental policy and measures
- Evaluating the human impact on agricultural landscapes
- Green infrastructure in spatial planning
- Investigation of bird migration ecology and dynamics of bird communities
- Landscape planning, management and maintenance
- Land-use and driving forces of land-use change
- Management of protected areas
- Methodological approaches for landscape and biodiversity monitoring
- Regional development, planning and policy

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Recent publications

Eichorn, G., Drent, R.H., Stahl, J. Leito, A., Alerstam, T. 2009. Skipping the Baltic: the emergence of a dichotomy of alternative spring migration strategies in Russian barnacle geese. Journal of Animal Ecology, 78(1), 63–72.

Leito, A., Keskpaik, J., Ojaste, I., Truu, J. 2006. The Eurasian Crane in Estonia. Eesti Loodusfoto, EMU PKI, Tartu.

Palang, H., Alumäe, H., Printsmann, A., Rehema, M., Sepp, K., Soovälli-Sepping, H. 2011. Social landscape: ten years of planning valuable landscapes in Estonia. Land Use Policy, 28(1), 19–25.

Sepp, K., Bastian, O. 2007. Studying landscape change. indicators, assessment and application. Landscape and Urban Planning, 79, 125–190.

Sepp, K., Roose, A. 2009. Towards multifunctionality of mining landscapes in the Estonian oil shale basin: typologies, assessment and planning. Oil Shale, 26(3), 432–441.

DEPARTMENT OF LANDSCAPE ARCHITECTURE

Our mission is to provide a lively, exciting yet challenging and supportive learning and research environment where students can meet and interact with the top-class teachers from within Estonia and from elsewhere in Europe and beyond. Since landscape architecture is intimately connected with places used by people in both everyday life and also time for relaxation and recreation, the department can offer advice, carry out special studies and research and supply problem solving services to national and local government, companies and community groups.

Research and studies

- Historic and modern cultural landscapes and settlement structure (cultural associations in the landscape)
- History of architecture and landscape architecture;
- Landscape design and aesthetics
- Public open space, healing landscapes (landscape and health), outdoor recreation areas, restoration of industrial and disturbed landscapes
- Universal design of outdoor rooms (accessibility to buildings and outdoor space)
- Landscape and visual impact assessment (Environmental Impact Assessment and Strategic Environmental Assessment)
- Spatial planning
- Landscape planning, management and maintenance

Landscape Theatre

http://pk.emu.ee/en/structure/landscapearchitecture/landscapetheatre/

Virtual Landscape Modelling and Visualisation System

The system's software enables modelling and real-time visualisation on a 160 degree cylindrical relocate-able screen of accurate, life-like urban, rural and natural landscapes with natural atmospheric effects. The source data can be derived from either GIS or CAD based databases, which typically includes elevation data, aerial ortho-imagery, land-use and biotope maps, shape files of vectors and polygons and accurately textured 3D models.

The installation can host up to 15 people at a time and display computer generated landscapes that are freely navigable. The viewing experience is immersive – with many people readily getting the feeling of being in the actual landscape. This helps to simulate different environments in the laboratory more precisely, thus eliciting responses of higher validity from participants.

The Landscape Theatre can also be used in the study of landscapes, visual impact assessment and environmental perception. While the Theatre can greatly assist in regional and landscape planning, it is also a valuable tool for spatial planning of smaller areas and prominent single sites. The Theatre is also used in teaching situations when an overview of a current situation or process happening over a large area is necessary.

The Theatre can be relocated within a day, which makes it a feasible option, for example, for use at public participation meetings. The highly immersive experience has been found to generate greater public interest and participation in spatial planning issues and therefore to achieve more democratic results in decisions influencing landscapes as public resources.

Maarja Koosa

Staff

Simon Bell - Professor, PhD, Head of Department, Outdoor recreation planning and design, Landscape and visual impact assessment

Friedrich Kuhlmann - Professor, Dipl.Ing., Urban design and landscape urbanism, landscape and life-style, living landscape, automobility and landscape, theory and history of recent landscapes, pre-fabricated housing areas in change

Mart Külvik - Extraordinary Professor, PhD, Biosciences and environment, research relating to environmental policy, environmental economy and environmental law (biodiversity management)

Juhan Maiste - Extraordinary Professor, PhD, Art history, Estonian manor parks, historical parks

Mari Nõmmela - Associate Professor, MSc, Culture and society, history of Estonian architecture and landscape architecture

Toomas Muru - Lecturer, MSc, Landscape character analysis, spatial planning, urban green structure planning, forest landscape planning and design.

Peeter Vassiljev - Lecturer, MSc, Recreation related environmental psychology, spatial planning

Kadri Maikov - Lecturer, MSc, Design principles of healing landscapes, CAD for landscape architects

Anna-Liisa Unt - Lecturer, Urban public space, design and use studies

Merle Karro-Kalberg - Lecturer, Drawing, urban public space, design

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Recent publications

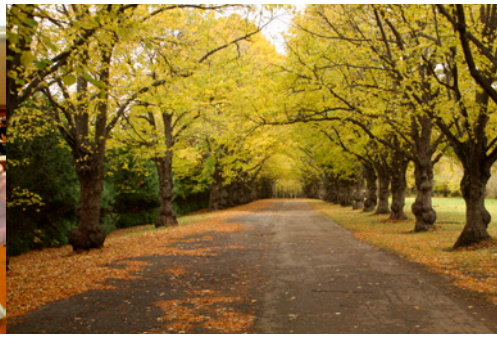
Bell, S., Apostol, D. 2008. Designing Sustainable Forest Landscapes. Taylor & Francis.

Külvik, M., Maiste, J. 2009. Park is Paradise in Art and Nature. Summaries. Introduction. Külvik, M., Maiste, J. (eds.). Park on paradiis looduses ja kunstis, 364–365, Eesti Maaülikool.

Kuhlmann F., Balicka J. 2009. Sugarland, urban development by tracing invisible ruins. In: Ghersi A., Mazzino F. (ed.). Landscape&Ruins. Proceedings of ECLAS Conference 2009, Alinea editrice, Firenze.

Vassiljev, P., Kuldkepp, K., Külvik, M., Kull, A., Mander, Ü. 2007. Recreational trail planning in the context of seasonality. E. Tiezzi, J.C. Marques, C.A. Brebbia & S.E. Jørgensen (eds.). Ecosystems and sustainable development, 353–364, Southampton, Boston, WIT Press.

Maikov, K. 2009. Landscape characteristics as personal experience stimulators in healing gardens. In: Health and recreation in Forest and Landscape: Health and recreation in Forest and Landscape, challenges, theories, empirical studies, and practical solutions. Hunziker M., Bauer N. (eds.). Birmensdorf, 2009, 110–110.



DEPARTMENT OF HORTICULTURE

Research and studies

- Physiology and biochemistry of horticultural plants
- Cultivation technologies of fruits, vegetables and ornamentals
- Post-harvest quality and storage technologies of horticultural products
- Urban horticulture

Staff

Kadri Karp - Professor, DSc, Head of Department, Fruit production, berry cultures

Sirje Vabrit - Associate Professor, DSc, Ornamental plants, design of green areas

Ulvi Moor - Associate Professor and Researcher, PhD, Post-harvest quality and storage technologies of horticultural crops

Marge Starast - Associate Professor, PhD, Plant physiology, fruit production, berry cultures

Priit Põldma - Lecturer, MSc, Vegetable production, greenhouse horticulture

Ele Vool - Lecturer and Researcher, PhD, Fruit production, berry cultures

Department of Horticulture
Estonian University of Life Sciences
Kreutzwaldi 1
51014 Tartu

@ http://pk.emu.ee/en/structure/horticulture

Contact: Prof. Kadri Karp
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(+372) 731 3515

Recent publications

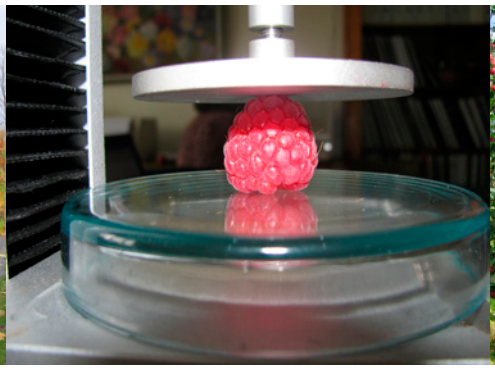
Moor, U., Karp, K., Põldma, P., Asafova, L., Starast, M. 2006. Post-harvest disorders and mineral composition of apple fruits as affected by pre-harvest calcium treatments. Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 56(3), 179–185.

Moor, U., Karp, K., Põldma, P., Pae, A. 2005. Cultural systems affect content of anthocyanins and vitamin C in strawberry fruits. European Journal of Horticultural Science, 70(4), 195–201.

Moor, U., Põldma, P., Tõnutare, T., Karp, K., Starast, M., Vool, E. 2009. Effect of phosphite fertilization on growth, yield and fruit composition of strawberries. Scientia Horticulturae, 119(3), 264–269.

Starast, M., Karp, K., Vool, E., Paal, T., Albert, T. 2007. Effect of NPK fertilization and elemental sulphur on growth and yield of lowbush blueberry. Agricultural and Food Science, 1, 34–45.

Vool, E., Karp, K., Moor, U., Starast, M. 2007. Yield Quality in some Taxa of the Genus Rubus Depending on the Cultivation Technology. European Journal of Horticultural Science, 72, 32–38.



CENTRES

To improve co-operation with entrepreneurs and research organisations outside our university we have seven centres. Three of them are part of IAES and four are interdisciplinary centres with aim to improve also co-operation between different institutes in our University. Such collaboration helps to cover requirements of the community and strengthen University's role in the society.

RÕHU EXPERIMENTAL STATION

Rõhu Experimental Station

Rõhu, 61409, pk.31
Tähtvere vald
Tartumaa
Estonia

@ http://pk.emu.ee/en/structure/rohuexperimentalcentre

Contact: Director: Toomas Tõrra
toomas.torra@emu.ee
(+372) 741 8535

Introduction of Experimental Station

The Rõhu experimental station has been part of IAES since March 2007 when the experimental centre at Rõhu and the experimental station at Eerika were merged. Rõhu is IAES' main base for field experiments. The activities of the station are mainly focusing on plant breeding and on various agricultural field trials.

Experimental Station Land Fund

Rõhu has a total 60 ha of land, of which 36 ha are arable, 9 ha are under experiments (e.g. energy crops, apple-tree, grapes, etc.) and 15 ha is miscellaneous (e.g. buildings, road, hedges etc.)

POLLI HORTICULTURAL RESEARCH CENTRE

Short historical overview

Polli Horticultural Research Centre joined EMU in 1995 and is the centre for fruit and berry breeding and cultivar's trials with a history of more than half a century. Research has been focused on providing cultivars and growing technologies suitable for the region. It is responsible for preserving the genetic resources collections of fruits and berries of over 1000 accessions. Besides 50 ha of top fruit and berry experimental plots and laboratory facilities, new cold storage and CA storage facilities with experimental layout chambers were completed and fruit processing facilities of product development centre launched with pilot scale range processing equipment. Interdisciplinary research approaches involve also other research groups within the university

Areas of development and research activity

- Breeding apple, pear, plum, sweet cherry, black currant, and new raspberry cultivars and apple vegetative rootstocks
- Scientific research in new technologies of fruit and berry cultivation, plant protection, organic cultivation and post harvest handling
- Introducing new cultivars for fruit and berry production in Estonia; evaluation of cultivars for use in commercial production
- Investigating new crops: sea buckthorn, edible honeysuckle, rowan tree
- Preserving genetic diversity and cultivars' resources of fruit and berry crops of Estonian origin
- Research on post harvest physiology of fruit storage in Controlled Atmosphere (CA) and Ultralow Oxygen (ULO) conditions
- Research and development projects in the field of processing horticultural products
- Initiation of various educational programmes and workshops

Polli experimental fruit and berry processing unit

@ http://polli.emu.ee/index.php?lang=eng

Polli experimental fruit and berry processing unit is a part of Polli Horticultural Research Centre, which activities are:

- Product development in the field of processing horticultural products
- Individual consulting on product development together with assisted use of processing equipment
- Small scale experimental production

Recent publications

Tuovinen, T.; Kikas, A.; Tolonen, T.; Kivijärvi, p. (2006). Organic mulches versus black plastic in organic strawberry: does it make a difference for ground beetles (Col., Carabidae)? Journal of Applied Entomology, 130, 495 - 503.

Arus, L., Luik, A., Monikainen, M., Kikas, A. (2010). Does mulching influence potential predators of raspberry beetle? . Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 1 - 7. [accepted]

Kikas, Ave; Kaldmäe, Hedi; Libek, Asta (2010). Genotype and climate conditions influence the drop off of flowers and premature berries of blackcurrant (Ribes nigrum L.). Acta Agriculturae Scandinavica: Section B, Soil and Plant Science, 1 - 8. [accepted]L

Kahu, Kersti; Jänes, Heljo; Luik, Anne; Klaas, Liidia (2009). Yield and fruit quality of organically cultivated blackcurrant cultivars. Acta Agriculturae Scandinavica, Section B - Plant Soil Science, 59(1), 63 - 69. L

Kaldmäe, H; Libek, A; Kikas, A; Arus, L. (2010). Influence of Pollination Conditions on Fruit Set of Selected Blackcurrant Genotypes and Recently Released Cultivars. International Journal of Fruit Science, 10(2), 187 – 194

Raudsepp, P.; Kaldmäe, H.; Kikas, A.; Libek, A.; Püssa, T. (2010). Nutritional quality of berries and bioactive compounds in the leaves of black currant (Ribes nigrum L.) cultivars evaluated in estonia. Journal of Berry Research, 1(1), 53 - 59.

Staff

Ave Kikas - Senior Researcher, PhD, Head of Centre, Small fruits breeding, testing, cultivation and handling technology, genetic resources

Heljo Jänes - Senior Researcher, PhD, Stone fruits breeding and testing, stone fruits rootstocks

Asta-Virve Libek - Senior Researcher, PhD, Small fruits breeding, testing, cultivation technology

Toivo Univer - Project manager, PhD, Scab resistant apple breeding, apple cultivar and rootstock evaluation, sea buckthorn and rowan tree cultivars evaluation

Liina Arus - Researcher, MSc, PhD student, Raspberry cultivars investigation, breeding, agrotechnologies, plant protection, entomophagous studies. Edible honeysuckle cultivar investigation

Liidia Klaas - Researcher, MSc, Growing technologies of the stone fruits, pears and strawberries

Kersti Kahu - Researcher, MSc, Apple, stone fruits, small ruits integrated control system, organic farming.

Neeme Univer - Researcher, MSc, Apple cultivars and rootstocks evaluation, Controlled Atmosphere storage of apples

Krista Tiirmaa - Researcher, MSc, Apple cultivars evaluation and pome fruits genetic resources

Polli Horticultural Research Centre

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Contact: Head of the Centre: Ave Kikas
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(+372) 433 1443

Ann Ojarand - Researcher, chemistry-analyst, MSc

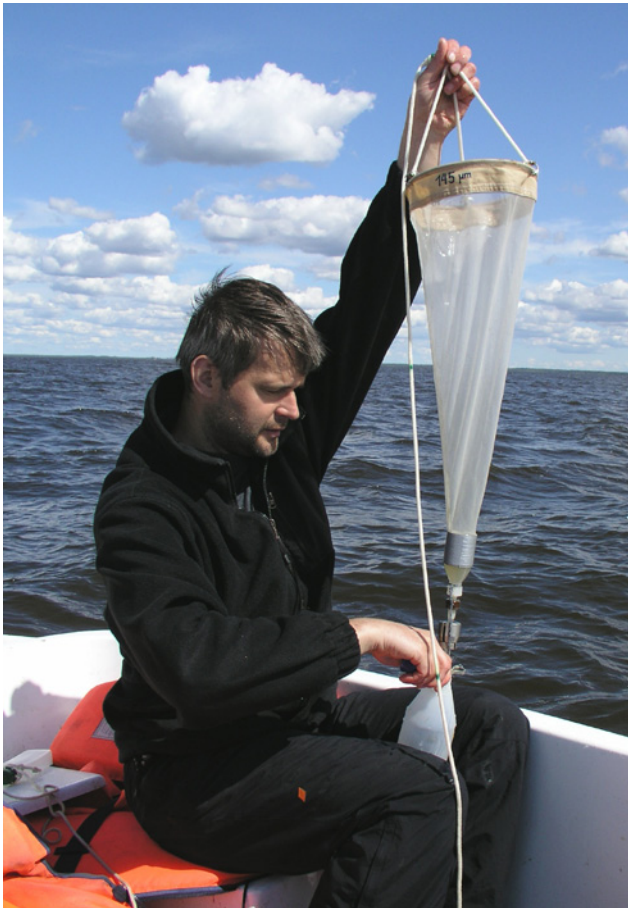
Hedi Kaldmäe - Senior specialist, PhD student, Small fruit genetic resources

Uko Bleive - Technician, PhD student, CA storage and post harvest processing of fruits

CENTRE FOR LIMNOLOGY

Short historical overview

The history of the Centre for Limnology (up to 2005, known as the Limnological Station) goes back to 1954, when the first field station was created in a small farmhouse close to Lake Võrtsjärv. The opening of the new building in 1963 was an important milestone in the history of Estonian limnology. The centre is part of IAES.



Areas of development and research activity

- Fundamental research into Estonian water bodies
- Teaching of students and post-graduate students (applied hydrobiology)
- Applied research (state environmental monitoring, fish management, environment impact assessment, lake restoration, nature protection)
- Limnological database includes material of about 730 small Estonian lakes

Recent publications

Recent publications can be found at:
http://pk.emu.ee/en/structure/limnology/research/

Staff

Ingmar Ott - Professor, PhD, Ecology of inland water bodies, algology, applied hydrobiology

Tiina Nõges - Research Professor, PhD, Limnology, ecology and management of large lakes, climate change impact on lakes, lake food webs and carbon cycles

Peeter Nõges - Leading Researcher, PhD, Limnology, phytoplankton ecology, climate change impacts, Water Framework Directive

Tarmo Timm - Senior Researcher, Dr. Biol.Sci., Aquatic Oligochaeta of Estonia and the world, zoobenthos of Estonian lakes

Henn Timm - Senior Researcher, Cand. Biol.Sci (PhD), Freshwater macroinvertebrates: ecology and monitoring

Juta Haberman - Senior Researcher, Cand. Biol.Sci (PhD), Ecology of large lakes, zooplankton, relationships between zooplankton and phytoplankton, effects of changes in the trophic state of lakes and in climatic changes on zooplankton

Ilmar Tõnno - Senior Researcher, PhD, Paleolimnological investigations (pigments, stable isotopes) in lakes

Sirje Vilbaste - Senior Researcher, PhD, Ecology and distribution of algae and macrophytes, assessment of the state of water bodies

Arvo Tuvikene - Senior Researcher, PhD, Fish physiology, aquatic toxicology, biomarkers of water pollution

Reet Laugaste - Senior Researcher, PhD, Ecology of phytoplankton and periphyton, taxonomy of diatoms

Külli Kangur - Senior Researcher, PhD, Hydrobiologist, ecology of large lakes, effects of natural and man induced pressures on the ecosystems of large lakes

Andu Kangur - Senior Researcher, PhD, Ichthyologist, biology and population dynamics of fishes in Estonian large lakes, feeding relations of fishes, eel fishery

Priit Zingel - Senior Researcher, PhD, Lake food webs, protozoan ecology, zooplankton, feeding of the young-of-the-year fish

Tõnu Möls - Extraordinary Senior Researcher, Cand. Math. (PhD), Mathematical methods in ecology, modelling of hydrobiological systems

Peeter Kangur - Researcher, PhD, Ichthyologist, biology and population dynamics of fish in Estonian large lakes, relationships of fish community with the ecosystem as a whole

Kati Orru - Researcher in environmental sociology, MA, MPh, PhD Researcher on Europeanisation of environmental health risk regulation in Eastern European countries, Department of Geography at King's College London

Kai Piirsoo - Researcher, PhD, Phytoplankton ecology and taxonomy

Helle Mäemets - Researcher, PhD, Ecology of aquatic plants, floristics, bioindication

Eva-Ingrid Rõõm - Researcher, PhD, Natural sciences and engineering, chemistry and chemical technology, efflux of carbon containing greenhouse gases from wetlands

Võrtsjärv Centre for Limnology

61101 Rannu municipality
Tartu County
ESTONIA

@ http://pk.emu.ee/en/structure/limnology/

Contact: Head of the Centre: Ain Järvalt
info@limnos.ee,
(+372) 745 4544

Jaana Salujõe - Researcher, PhD, Fish feeding on zooplankton, cladoceran remains in sediment

Helen Agasild - Researcher, PhD, Zooplankton ecology, food web interactions

Anu Kisand - Researcher, PhD, Role of sediments in lakes, eutrophication, the origin of humic substances in lake sediments

Ain Järvalt - Researcher, MSc, Estimation of fish stocks, biomanipulation, eel management

Lea Tuvikene - Researcher, MSc., Matter circulation in shallow lakes, water quality, monitoring and management of inland water bodies

Peeter Pall - Researcher, MSc, Water quality of streams, stream ecology

Teet Krause - Researcher, MSc, Estimation of fish stocks in small lakes, coreconids

Anu Palm - Researcher, MSc, Estimation of fish stocks in small lakes

Malle Viik - Researcher, MSc, Water quality (hydrochemistry) and dissolved organic matter of streams

Toomas Kõiv - Researcher, MSc, General limnology, lake management and restoration

Rein Järvekülg - Researcher, MSc, Fish fauna of rivers, monitoring, protection and rehabilitation of rivers.

Tõnu Feldmann - Researcher, MSc, Macrophytes monitoring, macrophytes as active and passive part in lake ecosystem

Marina Haldna - Researcher, MSc, Statistical data analysis and statistical modelling

Kersti Kangro - Extraordinary Researcher, MSc, Phytoplankton ecology and primary production

LAKE VÕRTSJÄRV STUDY AND EXPERIMENTAL CENTRE

The Centre is situated on the banks of Estonia's biggest internal water body, Lake Võrtsjärv, right beside the University's Limnology Centre.

We deal with informal nature education, introducing Estonian water biota to the public.

Our museum has exhibits of living Estonian freshwater fish instead of classical taxidermy display stands. Our live exhibits comprise approximately half of Estonian freshwater fish. We have 15 all year-round indoors aquariums and during the summer-time our fish also use capacious outdoor pools. Our oldest showpiece exhibit is a 24 year-old eel.

Lake Võrtsjärv Study and Experimental Centre
61117 Rannu municipality
Tartumaa
ESTONIA

@ http://kalala.emu.ee/

Contact: Anu Metsar
anu.metsar@emu.ee
(+372) 527 5630

In our exhibition you can find:

- Common Estonian fish (pike, perch etc.)
- Rare Estonian fish (asp, mud loach etc.)
- Foreign fish species (Russian sturgeon, sterlet or, etc.)
- Invertebrates (mainly crayfish and zooplankton) and hydrophytes
- Fossils dating from the Devonian period and reproductions
- Fishing equipment, historical and contemporary

We organize in-service trainings on freshwater biota (mainly for teachers). For students we have several active learning courses for exploring nature.

RESEARCH CENTRE OF ORGANIC FARMING

Areas of development and research activity

- Research of organic food and agriculture
- Promotion and education of organic food and agriculture
- Finding the best solutions for developing the organic sector in a close cooperation with entrepreneurs.

Centre of Organic Farming is an interdisciplinary centre of the University. We investigate different organic plant production technologies and their influence on soil and plant health, production quality, biodiversity etc. Although there are small-scale field trials near the centre, we also have started to develop a network of organic producers to conduct experiments in their fields.

Research Centre of Organic Farming
Estonian University of Life Sciences
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Estonia

@ http://mahekeskus.emu.ee/en/

Contact: Head of the Centre: Sirli Pehme
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In order to raise public awareness about organic food, we introduce organic principles at different levels, starting from kindergartens.

To help to develop the organic sector in Estonia, we also work on organic processing and marketing issues. We work in cooperation with entrepreneurs and research institutions from Estonia and abroad. Please feel free to contact us, if you are interested!

CENTRE OF RENEWABLE ENERGY

The purpose of the centre is to develop co-operation between workgroups and support our researchers in following tasks:

- Renewable energy related information and consulting
- Initiating and leading renewable energy projects
- Participating in cooperation networks

The Centre is bringing together wide approach of research of renewable energy, for industrial partners we offer:

- **Consultation** regarding growing different energy crops and short rotation forest.
- **Specific related research**, for example soil maps, biomass resource and quality, energy audits, cost benefit analysis, etc.
- **Laboratory analysis**, for example calorific value of firewood, biogas potential, chemical characteristics of biomass, etc.
- **Engineering and product development**, for example construction of pilot units and testing fuels in Engine Tests Bench

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University has renewable energy **research and development cooperation** with many different companies, if we look by economic branches then most important partners are: forestry, agriculture, energetics and waste management field companies and organisations.

Once a year a national conference **Investigation and Usage of Renewable Energy Sources** (TEUK) is organised, where the main focus is to introduce latest renewable energy research in Estonia and to bring together scientists, practitioners and politicians.

UNIT OF BIOCONVERSION OF CROPS AND WASTES

Established in October 2007, the unit is an interdisciplinary R&D team associating scientists and personnel from the Institute of Agricultural and Environmental Sciences, the Institute of Technology and the Institute of Veterinary Medicine and Animal Sciences.

Our research facilities consist of:

- The Laboratory of Bio- and Environmental Chemistry
- The installation for development of pilot scale anaerobic digesters (Instrumentation - Control – Automation)

The Unit has five main roles:

- **Analysis** of substrates suitable for bioconversion and the prediction of their methanogenic potential
- **Development** of basic research in bioconversion of wastes and crops to renewable fuels
- **Monitoring** of fermentation processes at pilot and full-scale by developing an ICA strategy
- **Scientific and technical training** of EMU scientists and partner organizations
- **Expert assistance** for the development of anaerobic digestion at full-scale in Estonia.

Our main research goals are:

- Creation of a database on characteristics and biogas potential of various crops and wastes
- Biogas potential and parameters from Estonian crops and wastes in order to define the operational parameters for further pilot and industrial scale digesters
- Potential inhibitors including kinetics and efficiency of biogas production
- Potential toxicity of solid (anaerobic composts) and liquid (leachates) residues after anaerobic digestion of wastes and crops.

Unit of Bioconversion of Crops and Wastes
Estonian University of Life Sciences
Kreutzwaldi 5
51014 Tartu
Estonia

@ http://www.emu-bioconversion.eu/

Contact: Liina Nurk
liina.nurk@emu.ee
(+372) 731 3255

Currently the Unit is focused on two projects:

- Development of innovative technologies for sustainable manure management
- Anaerobic co-digestion process optimisation for sewage sludge and agricultural waste based mixtures. Development of process monitoring and control methods.

CENTRE OF AGROBIOTECHNOLOGY

Our mission is to be a flexible and professional administrative support unit offering help on realising agrobiotechnological ideas by involving entrepreneurs, scientists and students, and to collaborate with other universities, public institutions and organisations.

Our aims:

- Implement the results of basic research in business field, thus offer knowledge-based competitive advantage to entrepreneurs
- Implement the (new) technologies to process Estonian origin basic products to final products
- Support the knowledge-based problem solving in business

Centre of Agrobiotechnology
Estonian University of Life Sciences
Kreutzwaldi 5
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Estonia

@ http://akprojekt.emu.ee/en/

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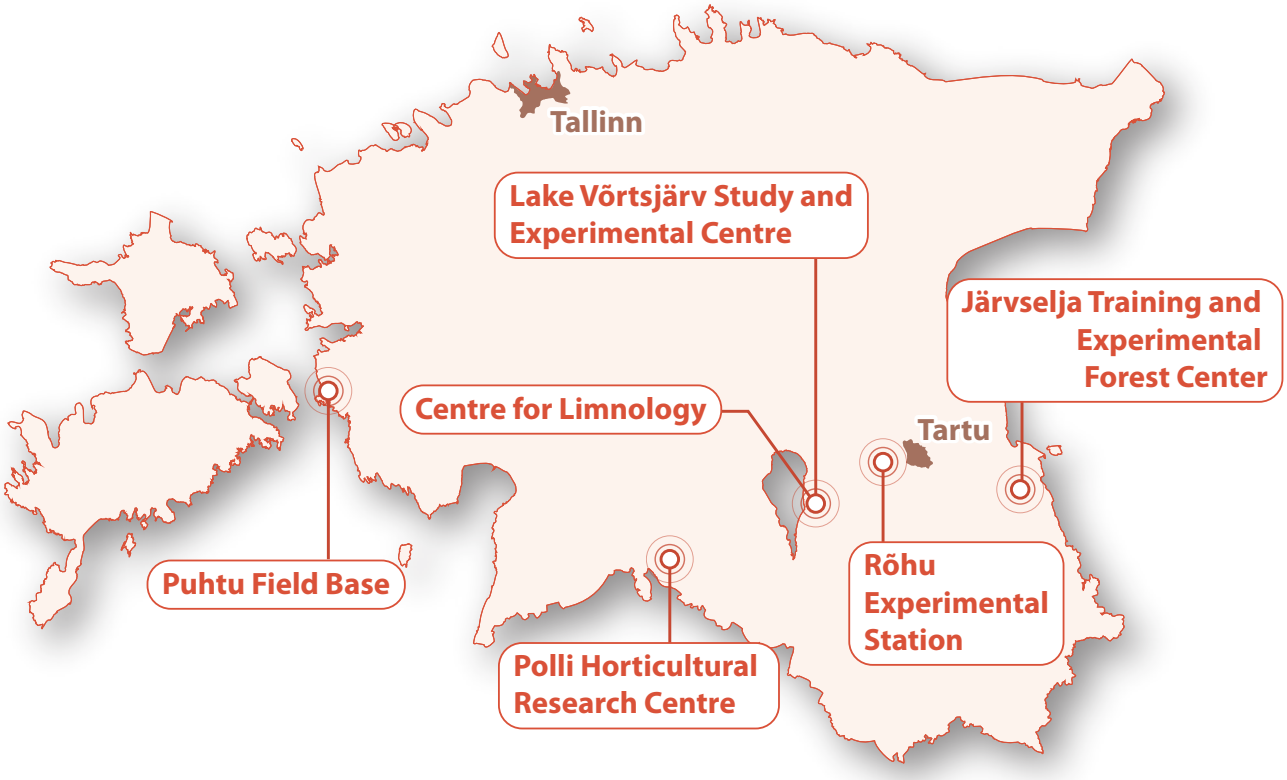
(+372) 731 3844

Map of Centres and Field bases of IAES



IAES is involved in following scientific fields:

AREA TITLE	ACTIVITIES
Plant Cultivation and Plant Biology	Plant cultivation: Science and technologies; Crop products: processing and storage. Grassland science: Herb feeds - production and quality control; Grassland herbs: biology of growth and development, management and productivity. Soil management systems. Sustainable plant cultivation. Bio energy crops. Plant stress biology, biogenic emissions
Horticulture	Fruit cultivation; greenhouse cultures, ornamental gardening, quality control, processing and storage of fruit cultures, fruit breeding and biochemistry of fruit cultures
Plant Health	Plant protection – chemical, integrated and natural plant protection; phytosanitation Applied entomology – ecology, physiology, etology, morphology, ecochemical communication; nematology Phytopathology – plant diseases (fungal, bacterial and viral diseases) and methods of control
Soil Science and Agrochemistry	Soil ecology, chemistry and physics; functioning of soils and humus status; substance turnover within soil systems; soil-plant-environment; plant fertilizer uptake and optimal fertilization; soil genesis and taxonomy; soil maps and databases; rational land use
Environmental Science and Landscape Management	Environmental protection and management, environmental economics, environmental audits and assessments, analysis of environmental risks, bioenergy, biotic and abiotic markers of environment, habitat quality, landscape ecology and management, relationships between landscape structure and organisms, valuable landscapes and their functions, changes in land use and different scenarios, spatial planning, landscape management, restoration of disturbed landscapes, nature protection.
Landscape Architecture	Historic and modern cultural landscapes and settlement structure; landscape design and aesthetics; history of architecture and landscape architecture; design of public open spaces, healing landscapes, outdoor recreation areas, design of industrial and disturbed landscapes; universal design of outdoor space; landscape and visual impact assessment; spatial planning; landscape design and maintenance
Biological Diversity	Development, protection and monitoring of biodiversity; ecology of agricultural systems; botany, zoology and mycology, floral design, faunistics and fungistics, biosystematics, population and production biology; nature tourism
Applied Hydrobiology	Freshwater ecology, hydrochemistry and physics, limnology, planktonology, microbiology of water; wildlife, protection and resource studies of water bodies; ecotoxicology of water bodies; freshwater fish, assessment and management of freshwater fish stocks, protection of endangered fish species; limnological modelling, remediation of landlocked water bodies, creating wildlife habitats in artificial water bodies

INTERNATIONAL RESEARCH PROJECTS

- Adaptive Strategies to Mitigate the Impacts of Climate Change on European Freshwater Ecosystem (REFRESH). EU 7th Framework project, SP1-Cooperation, Collaborative project, Large-scale integrating project, 2010-2014. T. Nõges, chief perfomer.
- Adolescence for Renewable Energies in Transport (ADORE IT). EUROPEAN European Commission Intelligent Energy Project, 2008-2011. K. Heinsoo, Estonian coordinator.
- Auditing the Sustainability of Public Spaces (ASPIS). DG EAC Lifelong Learning Programme, 2009-2012, F. Kuhlmann, K. Sepp, Estonian coordinators.
- Baltic Green Belt. INTERREG IVB project of the Baltic Sea, 2009-2012. K. Sepp, H. Järv, Estonian coordinators.
- Biological Effects of Anthropogenic Chemical STress: Tools for the assessment of Ecosystem Health (BEAST). THE BONUS+ PROGRAMME, 2009-2011. S. Vilbaste, principal investigator.
- Culture and Nature: The European Heritage of Sheep Farming and Pastoral Life (CANEPAL). DG EAC Culture Programme, 2010-2013. S. Bell, M. Semm, K. Sepp, Estonian coordinators.
- Estonian Biodiversity Database. EEA Financial Mechanism, Norwegian Financial Mechanisms, 2008-2011. M. Rahi, chief performer.
- European Biodiversity Observation Network: a project to design and test a biodiversity observing system integrated in space and time (EBONE). EU 7th Framework project, 2008-2012. K. Sepp, national coordinator, M. Külvik and V. Kuusemets, principal executors.
- Increasing Competitiveness of Estonian and Latvian Food Industry Based on New and Improved Local Fruit and Berry Production Development (GoodFruit). European Foundation of Regional Development, 2008–2011. A. Kikas, project coordinator.
- Nature Based Entrepreneurs and Vocational Education Training Providers Learning and Working Together (ENVOLWE). LIFELONG Learning Programme, LEONARDO DA VINCI TRANSFER OF INNOVATION PROJECT, 2009-2011. L. Sudakova, chief performer.
- Core Collection of the Northern European Gene Pool of Ribes (RIBESCO). EC DG AGRI Community programme, 2007–2011. H. Kaldmäe, Estonian coordinator.
- Regional Exchanges and Policy Making for Protecting and Valorising Biodiversity in Europe (REVERSE). INTERREG IVC projects of Europe, 2009-2012. K. Kruusmaa, M. Noormets, K. Sepp, Estonian coordinators.
- Securing the Conservation NATURA Grassland Habitats with the Distributed Bioenergy Production (PROGRASS). LIFE+, 2009-2012, K. Heinsoo, principal investigator.
- Organic Matter (peats) decomposition kinetics in histosols. ESTONIAN-POLISH research projects, 2010–2012. R. Kõlli, L. Szajdak, project leaders.
- The Nitrogen Cycle and Its Influence on the European Greenhouse Gas Balance (NitroEurope). EU 6th Framework project, 2006-2011. Ü. Niinemets, chief perfomer.
- Water Bodies in Europe: Integrative Systems to Assess Ecological Status and Recovery (WISER). EU 7th Framework project, 2009-2012. Tiina Nõges, chief perfomer.

RESEARCH PROJECTS

Estonian Science Foundation (ETF) grants and target funding themes (SF)

@ https://www.etis.ee

- SF theme “Animal ecology, systematics and conservation”, target foundation grant of Estonian Ministry of Science and Education, 2008-2013 (project leaders: U. Tartes (2008–2010); O. Kurina (2010–)).
- SF theme „Biotic and abiotic markers for the evaluation of complex anthropogenic influences on habitats and landscapes”, target foundation grant of Estonian Ministry of Science and Education, 2007-2012 (project leader V. Kuusemets).
- SF theme “Diversity, integrity and sustainability of agroecosystems”, target foundation grant of Estonian Ministry of Science and Education, 2008-2011 (project leader T. Kull).

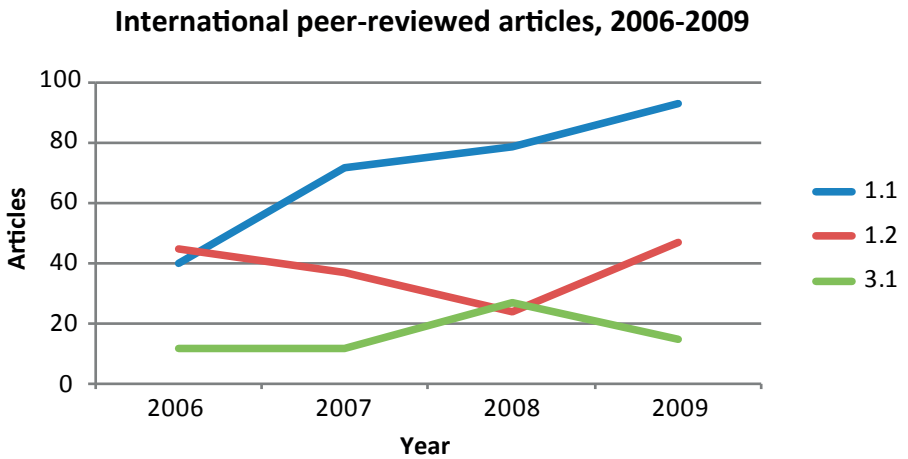
- SF theme “Effects of natural and man induced pressures on the ecosystems of large lakes”, target foundation grant of Estonian Ministry of Science and Education, 2008-2013 (project leader K. Kangur).
- SF theme “Improvement of assortment of fruit crops, maintenance of genetic diversity and development of environment-friendly cultivating methods II”, target foundation grant of Estonian Ministry of Science and Education, 2006-2011 (project leader A.-V. Libek).
- SF theme “Plant protection for sustainable crop production”, target foundation grant of Estonian Ministry of Science and Education, 2009-2014 (project leader A. Luik).
- SF theme “Plant stress ecophysiology”, 2007-2012, target foundation grant of Estonian Ministry of Science and Education (project leader Ü. Niinemets).
- SF theme “Will climate change alter the relative importance of catchment and in-lake processes in the carbon balance of shallow lakes?”, target foundation grant of Estonian Ministry of Science and Education, 2008-2013 (project leader T. Nõges).
- ETF grant 6801 Evaluation of economically important parameters and phenotypic and genetic traits in blackcurrant cultivars, elite selections and their pedigree in the Estonian breeding program, 2006-2009.
- ETF grant 7515, “Antioxidant activity of horticultural crops grown in Estonia depending on cultivation and storage technology”, 2008-2011 (project leader U.Moor).
- ETF grant 8511”Ciliate and metazooplankton trophic link in shallow and turbid eutrophic lake”, 2010-2013 (project leader H. Agasild).
- ETF grant 7682 “Cladistic argumentation of the system of the geometrid moths (Lepidoptera: Geometridae)”, 2008-2011 (project leader J. Viidalepp).
- ETF grant 7593, “Conservation genetics of the Greater Spotted Eagle and the Lesser Spotted Eagle and Applying new genomic technologies into the field of conservation genetics”, 2008-2011 (project leader Ü. Väli).
- ETF grant 7645, Constitutive and induced emission of volatile isoprenoids in forest trees”, 2008-2011 (project leader Ü. Niinemets).
- ETF grant 7643, “Creation and theoretical reasoning of the generalized synthetic database for water and biota of Estonian freshwater waterbodies”, 2008-2011 (project leader T. Möls).
- ETF grant 6958, “Effects of external stimuli to responses of antennal sensilla and searching behaviour of ground beetles and clic beetles (Coleoptera: Carabidae, Elateridae)”, 2007-2010 (project leader E. Merivee).
- ETF grant 8486, “Emission of Greenhouse Gases and Other Naturally Produced Trace Gases from Alkaline South-East Estonian Lakes”, 2010-2012 (project leader E.-I. Rõõm).
- ETF grant 8495, „Finding alternative solutions to pre-sprouting, through longer thermal shock treatment and use of humic extract, explaining their effect on the formation of yield structure elements of potato”, 2010-2013 (project leader V. Eremeev).
- ETF grant 7567, ”Floristic change of Estonian species-rich plant communities due to changed landuse in the second half of the 20th century“, 2008-2011 (project leader M. Otsus).
- ETF grant 7391, “Foraging behaviour of Bombus terrestris in farmland: impact of agricultural practices“, 2008–2012 (project leader M. Mänd).
- ETF grant JD109, “Is Lake Võrtsjärv a sink or source of atmospheric greenhouse gases?”, 2008-2010 (project leader E.-I. Rõõm).
- ETF grant 7600, “Is Lake Võrtsjärv an autotrophic or heterotrophic system? The role of autochthonous and allochthonous organic matter in the budget of a large shallow lake”, 2008-2011 (project leader T. Nõges).
- ETF grant 7513, “*Medicago falcata*/*M. sativa* complex in Estonia: distribution, morphological, cytological, and genetical variability of natural populations”, 2008-2011 (project leader M. Leht).
- ETF grant MJD14, “Plant defense reaction triggered by abiotic and chemical stressors”, 2009-2012 (project leader A. Kännaste).
- ETF grant 7272, “Plant heat tolerance – physiological background and ecological variation”, 2007-2011 (project leader K. Hüve).
- ETF grant 8110, “Process-based simulation of volatile organic compound emission from Estonian native and energy forest species”, 2009-2012 (project leader S. M. Noe).
- ETF grant 7631, “Seed viability, longevity and germination in Estonian terrestrial orchids”, 2008-2011 (project leader K.Tali).

- ETF grant 7622, "Soil compaction on grasslands: the effect of agricultural activity on soil deformation and plants", 2008–2011 (project leader E. Reintam).
- ETF grant 7558, "Systematics and biogeography of the tribe Leiini (Diptera: Mycetophilidae); Holarctic genera in global context" , 2008-2011 (project leader O. Kurina).
- ETF grant 7703, „The diversity of bioactive compounds in fruits and berries", 2008-2011 (project leader A. Kikas).
- ETF grant 7130, "The effects of food plants and microsporidiosis (*Microsporidia*, *Nosematidae*) on development and over-wintering physiology of insect pests on vegetable crops", 2007-2011 (project leader K. Jõgar).

PUBLICATIONS

IAES is actively participating in the international science field. The number of internationally peer-reviewed articles by our scientists is increasing every year.

The chart below gives an overview of IAES publications during 2006-2009, which are grouped by ETIS (Estonian Research Information System) Classification (more information: https://www.etis.ee/).



1.1 Research articles published in peer-reviewed journals indexed by either or both, Thomson Reuters Web of Sciences or ERIH (European Reference Index of the Humanities) categories A and B

1.2 Peer-reviewed articles in other international research journals with an ISSN Code and an international editorial board

3.1 Articles and chapters in books published by either international scientific publishers or indexed by Thomson Reuters ISI Proceedings


ÖNNELEID

Studies in IAES

Conforming to the principles of the European Higher Education Area, the Estonian University of Life Sciences has adopted the two-tier degree structure, which has a compulsory Bachelor's degree in all degree programmes.

According to an international evaluation (accomplished in 2007 and 2009), teaching at the Institute of Agricultural and Environmental Sciences is of a high European standard. All study programmes are based on accredited curricula.

Study levels:

- Bachelor's studies with the volume of 180 ECTS (European Credit Transfer and Accumulation System credits), official standard study period 3 years.
- Master's studies with the volume of 120 ECTS, official standard study period 2 years.
- Doctoral studies with the volume of 240 ECTS, official standard study period 4 years.

Our teaching and learning take place in a research environment where students benefit from interaction with researchers who are working at the frontiers of knowledge in their disciplines.

The Institute of Agricultural and Environmental Sciences has nearly 1,200 degree students and approximately 400 degrees are completed annually.

We have web-based Study Information System (SIS) of the Estonian University of Life Sciences. The database supports the organisation of studies, keeps and systemises data concerning the studies at the University.

For more information: http://www.emu.ee/en/studies

The Institute of Agricultural and Environmental Sciences offers the following degree programs:

HORTICULTURE

Horticulture is one of the most popular specialities in the University. The students of this field study all branches of agriculture: vegetable and fruit growing, greenhouse growing, decorative gardening and the preservation of horticultural produce.

The graduates of horticulture are warmly welcome in enterprises dealing with fruit and vegetables, production and preservation of decorative plants. Good skills in decorative plants and pests, outstanding designing skills in green area and private garden planning and supervision of garden maintenance and establishment allow the graduates to work in landscaping businesses as specialists and managers.

The proportion of optional subjects enables students to take courses from other universities either in Estonia or abroad.

What do the students learn?

- Production of high quality horticultural products;
- Contemporary methods in production optimisation;
- Preservation of horticultural products;
- Design and maintenance of green areas and private gardens.

FIELD CROP HUSBANDRY

Students studying crop husbandry get a versatile education. In addition to the speciality subjects, the existence of electives and optional subjects enables students to take courses from the curricula of other specialities. Students make use of contemporary facilities and they are allowed to spend some of the study time abroad.

Graduates of this field manage production in plant breeding and lead the work of agricultural enterprises. The education acquired also allows narrower specialisation, e.g. on plant biotechnology, organic farming, bioenergy production, plant breeding, plant protection, etc

What do the students learn?

- Plant biotechnology, plant protection, energy crop growing, organic farming, etc;
- Land use and contemporary mechanical technology;
- Environmental protection, economics, informatics.

AGRICULTURAL PRODUCTION AND MARKETING

Higher education in rural economy and sustainable use of natural resources allows flexibility in specialization, taking into account any changes in the labour market. Graduates of this field can analyse the economic efficiency and sustainability of different branches of rural economy, plan the development of enterprises, co-operation actions, farms and regions. Graduates are well aware of the scientific-innovative problems and developments of the agricultural sector as well as the research methodology applied and how to put them into practice.

What do the students learn?

- Animal and crop husbandry (including horticulture);
- Economics, marketing and economic analysis;
- Business management;
- Environmentally friendly, efficient and contemporary methods of production optimisation;
- Rational land use and the application of GIS;
- Sustainable administration.

FARM MANAGEMENT

This Bachelor's degree programme educates the managers of agricultural enterprises. Estonian agriculture could benefit from a growing base of well educated specialists who would guarantee the competitiveness of our firms and enterprises.

The curriculum offers both theoretical and practical knowledge in the field of agriculture and adds to management skills. Practical training in an agricultural enterprise is of great importance. Students perform their training in the best agricultural enterprises and factor markets of Estonia.

What do the students learn?

- Organisation and personnel management;
- Strategic planning and company management;
- Contemporary technologies and risk management, etc.

LANDSCAPE PROTECTION AND PRESERVATION

Students are introduced to all natural phenomena in the biosphere, geosphere, pedosphere, hydrosphere and atmosphere. Students get a thorough knowledge in land use and sustainable agriculture. Great emphasis is placed on the relationship between the landscape and regional development. All this is combined with environmental conservation and environmental science.

What do the students learn?

- Plan and elaborate on the environmentally friendly and aesthetic living environment;
- Work both in the public and private sector;
- Plan and preserve landscapes;
- Compile and apply different environmental measures, such as environmental impact assessment, environmental management, and environmental audit.

LANDSCAPE ARCHITECTURE

Landscape Architects are concerned with the design, management, preservation and use of the land. Landscape architects share with garden designers a concern for the planning and design of outdoor space. Like architects that design buildings where people enjoy working and living, landscape architects create comfortable, safe and interesting landscapes.

Landscape architects help to solve the problems concerning day-to day living space. Nowadays urban landscapes must accommodate commercial and residential needs, transportation requirements, leisure spaces and much more, for both public and private users. Students participate in general and detailed planning, perform visual evaluation of landscape quality and draw up plans for landscape preservation and old park restoration.

What do the students learn?

- Perceive nature, human culture and technical solutions;
- Develop creative and problem-solving abilities, communication skills, technical knowledge, environmental awareness and professional attitudes;
- Elaborate design proposals and find technical solutions for actual sites;
- Express themselves orally, graphically and in writing;
- Spatial planning, landscape planning and design and manage green areas;
- Plan, design and manage the functional environmentally friendly and aesthetic living environment.

MANAGEMENT OF URBAN AND INDUSTRIAL LANDSCAPES

This curriculum compiles natural, economic, social and technical sciences. Graduates of this course can plan sustainable activities in industrial and urban landscapes and develop high-quality living environments both in the countryside and in the town.

What do the students learn?

- Environmental policy and environmental management in industry and municipalities;
- Re-cultivate polluted landscapes and industrial areas;
- Plan environmentally friendly living environment and sustainable environmental technologies.

APPLIED HYDROBIOLOGY

Hydrobiology studies the diversity, structure and dynamics of aquatic fauna and flora and the biological processes in water-bodies. Applied hydrobiology focuses on the practical side: management and restoration of water-bodies, aquatic monitoring and the management of aquatic systems in the broader sense of the word.

This speciality aims to teach both scientist and specialists-practitioners. The Centre for Limnology, situated adjacent to the eastern shoreline of Lake Võrtsjärv, provides the best facilities for concentrating on applied hydrobiology.

Students participate in field trips, gather samples, do scientific experiments and analyse their results. Students become acquainted with a variety of fields of research: surveys of aquatic fauna and flora, methods of biomonitoring, the ecology of Lake Peipsi and Lake Võrtsjärv as well as small water-bodies and flowing water bodies, nature protection, toxicology, management of water-bodies, fisheries, etc.

Practical training and field trips to water bodies of Estonia – Lake Peipsi, Võrtsjärv, River Emajõgi and to many other small lakes and rivers – is a necessity.

What do the students learn?

- Water organisms and their ecology;
- Environmental physics and chemistry, toxicology;
- Marine science, hydrology;
- Foreign languages, communication psychology, philosophy;
- Estonian flora and fauna and their ecology;
- Environmental policy and environmental management environmental protection;
- Foundation of economics and law;
- Statistical data analysis;
- Methods of aquatic research.

NATURE TOURISM

Estonia is famous for its genuine and diverse nature – people interested in nature can find rare plants and animals, virgin marshes and woodlands.

Nature tourism is the travel through and enjoyment of the natural world, its seasonal cycles and events, carried out in a manner that promotes the protection of natural and human communities and consideration for those who will inherit our world.

Students accumulate a thorough knowledge of nature, tourism and entrepreneurship. The increasing number of tourists constitutes a real threat to our comparatively untouched nature, which makes tourism management and planning absolutely necessary.

Masters studies in this field concentrate more on specific topics in nature and international nature tourism.

What do the students learn?

- Diversity of Estonian nature and landscapes;
- Foundations of nature tourism, fishing and hunting tourism, tourism management, project management and project writing;
- Environmental philosophy and ethics;
- Environmental sociology, ecology, GIS;
- Skills necessary for nature guide: foreign languages, communication psychology, logic, risks and work safety in nature tourism, photography, methodology for nature mediation;
- Contemporary technologies and risk management, etc;
- Foundations of nature protection and environmental management.

INTERNATIONAL MASTERS' COURSES

Our University is actively developing international courses to improve students' mobility and the quality of the studies. At the moment international students can study at the BIOLANDMAN master's course and Applied Plant Biology study course. An international course on landscape architecture will also be opened soon. In addition we regularly organise short international courses of the BOVA and NOVA universities on agricultural and environmental sciences.

MANAGEMENT OF BIODIVERSITY AND MULTI-FUNCTIONAL ECOSYSTEMS (BIOLANDMAN)

2-year full-time

Concern over the environment and its quality for the future generations is a driving force in the search for new, sustainable management models for ecosystems and landscapes. Essential ecological, economic and social factors in biodiversity and landscape planning are discussed in the frame of the course.

The aim is to educate well-trained specialists in biodiversity, management of multifunctional landscapes and natural resources.

Students study the relationships of human activity and nature taking into consideration the principles of the ecosystem approach and sustainability. Students learn how to avoid and mitigate the depletion and destruction of ecosystems and landscapes, and as a last resort how to restore the integrity of various terrestrial and aquatic ecosystems.

APPLIED PLANT BIOLOGY

Understanding the global change effects on plant production and novel needs in changing environments is of key significance for establishing and management of flexible and competitive private companies in agricultural and environmental sphere. This section is part of the the Nordic Council of Ministers' most important framework programme in the area of lifelong learning Nordplus (programme ABS, atmosphere-biosphere studies, http://www.atm.helsinki.fi/ABS/).

The main objective is to prepare specialists with broad expertise in plant/climate interactions, with particular knowledge of global climate change effects on plant growth and productivity, and of the land-use change effects on environment (e.g., air, water and soil quality).

The courses provide state-of-the-art overview on the factors affecting plant carbon gain in future climates, on the factors air quality and of the role of volatile organic compounds in air quality, of the importance of these compounds for plants and of the possibilities of employing these emissions in biocontrol. Contemporary scientific advancements in the field of biogenic emissions are studied and discussed in the class, and the students learn to debate over the "hot topics" of biogenic emissions and atmospheric chemistry.

DOCTORAL PROGRAMS

AGRICULTURAL SCIENCES

The objectives are to train prospective research and teaching staff members, as well as leading specialists for positions:

- in universities, research and development institutions,
- as leading experts in governmental agencies, agribusinesses, rural enterprises and the sectors supporting these institutions.

ENVIRONMENTAL SCIENCES AND APPLIED BIOLOGY

The objectives are to train competent teachers, researchers and top specialists in environmental sciences and applied fields of biology for positions:

- in institutions of higher education, research and development institutes,
- as experts in government agencies, in institutions for the protection of nature and the environment and in agricultural production and the sectors that serves these institutions.

ESTONIAN LANDSCAPE ARCHITECTURE STUDENTS ORGANISATION

Landscape architecture – the entirety of landscape surrounds us, an extremely broad and complex domain, which contributes to the orientation of the Estonian Landscape Architecture Students Organisation. Our organisation includes students from both the Estonian University of Life Sciences and Tartu College of Tallinn University of Technology. The organisation provides excellent and practical opportunities for committed students to find professional guidance.

The Estonian Landscape Architecture Students Organisation was founded in Tartu in 1999 by the graduates of the first Landscape Architecture course (1994) who have been working as pioneers in our field in Estonia sharing their knowledge. In addition to the founding members, other experienced members and visiting lecturers visit us often to speak about topics in our speciality.

A weekly tradition is to meet once or twice a week, either to watch a film or attend lectures afterwards in the evenings, participate in competitions, attend product presentations, conduct workshops, practice football, listen to music or just enjoy good conversation with each other.

Membership in 2009 was 143.

ENVIRONMENTAL PROTECTION STUDENTS' ASSOCIATION

The Environmental Protection Students' Association (EPSA) of EMU (Keskkonnakaitse Üliõpilaste Selts, KÜS) is a non-profit student organisation, founded in Tartu, on March 19th 2001. EPSA's aims are: to improve both the professional skills and the ecological awareness and natural-interest of members, to cooperate with students and student organisations with similar interests in Estonia, to promote a nature and environmentally friendly way of thinking amongst the general public, to organise and participate in environmental events and also to organise social activities for members.

The association was founded to unite students of landscape protection and preservation in EMU and since the spring of 2005 all students of EMU who are interested in environmental protection can join the association. Membership in 2009 was 80.

ACCOMMODATION

@ http://www.emu.ee/en/student-life/practical-information/student-hostel/

The Estonian University of Life Sciences guarantees accommodation in its hall of residence for all international exchange students. The Life Science's campus is located 2 km from Tartu's Town Hall Square. There are two residential blocks – Betton (Tuglase 7) and Torn (Kreutzwaldi 52).

The rooms are mostly double rooms with a WC, shower and a small kitchen, but there are also single rooms available. There is a permanent Internet connection in every room. Visitors can use the bicycle depot and washing-machine.

Students can also find a room at a dormitory with the help of the Student Village, which is a non-profit organization. The Student Village owns eight fully functional dormitories. The dormitories are located at various places around the city. All dormitories are close to bus routes and the town centre.

SPORTS CENTRE

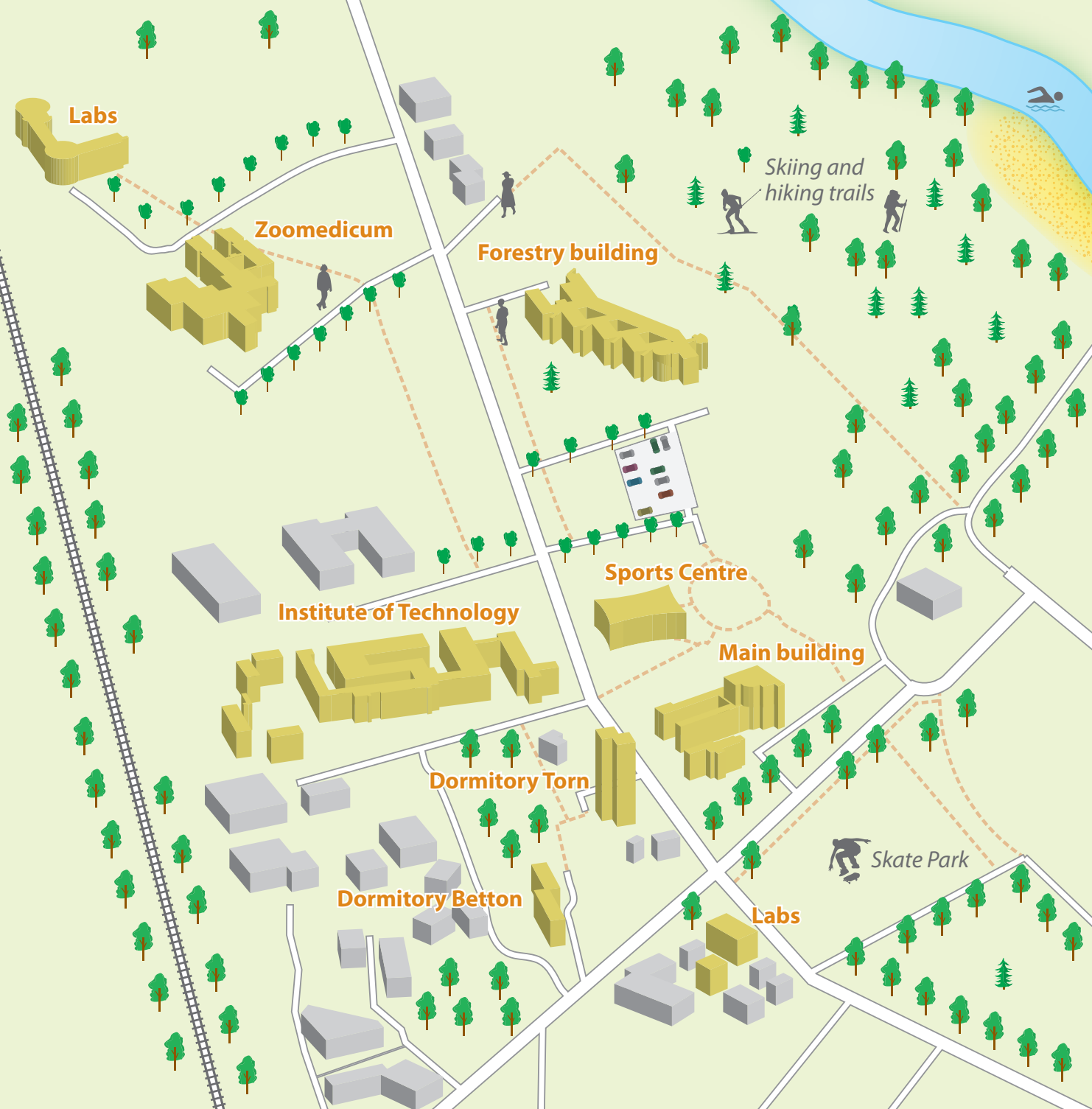
@ http://sport.emu.ee/

The Estonian University of Life Sciences' Sports Centre is located on campus, opposite the Main Building of the University, providing easy access and convenience for staff and students. The 2,437 m^2 sports and fitness complex was completed in 2009.

The Estonian University of Life Sciences is proud of its sports facilities. The Sports Centre is home to the majority of the indoor and outdoor facilities at the University.

We have:

- 3 outdoor volleyball courts
- 1 small outdoor soccer ground
- 3 indoor sporting halls
- 2 aerobics halls
- 1 climbing wall
- Table Tennis Room
- special rooms for weight lifting, wrestling and bodybuilding


Labs
Zoomedicum
Forestry building
Skiing and
hiking trails
Sports Centre
Institute of Technology
Main building
Dormitory Torn
Skate Park
Dormitory Betton
Labs

green print

Printed on recycled paper with inks based on natural resins and oils. ©Ecoprint

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Eesti Maaülikool

Estonian University of Life Sciences

Põllumajandus- ja keskkonnainstituut

Institute of Agricultural and Environmental Sciences